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THE CURTISS
STANDARD JN4-D
MILITARY TRACTOR
HAND BOOK

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THE CURTISS STANDARD JN4-D MILITARY TRACTOR

. . .

HAND BOOK

1918

ISSUED BY THE
CURTISS AEROPLANE AND MOTOR CORPORATION
BUFFALO, U. S. A.

Eng 5509.18.19

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INTRODUCTION

Generally as many questions are asked concerning the construction, assembly and details of an aeroplane, as there are men to ask the questions. And it is natural that these questions be directed to the manufacturer of the machine. A careful study of the various requests has resulted in concentrating the questions under the general heading of "How is the machine assembled?" Emphasis has never been previously placed on the correct system for unpacking the component parts, though this would appear to be the logical beginning. While the size and weight of these shipping cases would seem to contradict the warning, too much stress cannot be placed upon the injunction to handle all boxes with care, both in placing and opening. In the manufacture of the parts, the workmen are cautioned by signs all about them:

REMEMBER
A CONCEALED MISTAKE MAY
MEAN THE LOSS OF
A BRAVE LIFE

Careless opening of the cases may mean the undue straining of an otherwise rugged member. Realization of this fact and that sufficient care is not always exercised in uncrating and setting up the machines has led to the detailed directions given in this manual.

The physical conditions at the assembly depot may be more admirably suited for methods other than those outlined in this Hand Book.

But whatever the details of procedure, the underlying principles upon which the herein suggested methods are based, remain the same.

Note the cautions and ideas advanced. They mean sound machines after assembly.

In outlining the general method of assembly, basic principles are again followed. In the description of the adjustment of any machine, that which unfortunately cannot be formulated is the personal equation of the assembler. Several quick schemes may suggest themselves for preliminary set-ups, but it is well to finish the assembly and inspection according to the letter of the instructions. A manual which emphasizes the "Don'ts" tends to make the reader lose the perspective of the "Do." Yet the questions which have been the cause for the publishing of this book, have shown repeated disregard or misinterpretation of the instructions contained in all the packing cases. With each machine are packed the necessary blueprints showing the general details of the principal members, and the assembly-relations. These blueprints are as much an integral part of these printed instructions as construction drawings are of specifications. A careful study of both will answer most of the questions that arise in the course of field assembly.

CURTISS AEROPLANE AND MOTOR CORPORATION.

Buffalo, U. S. A., January, 1918.

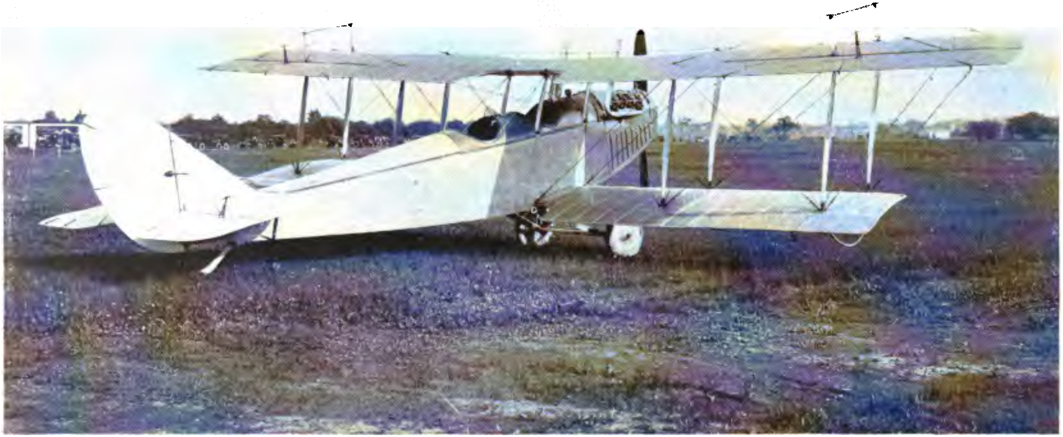

Fig. No. 1

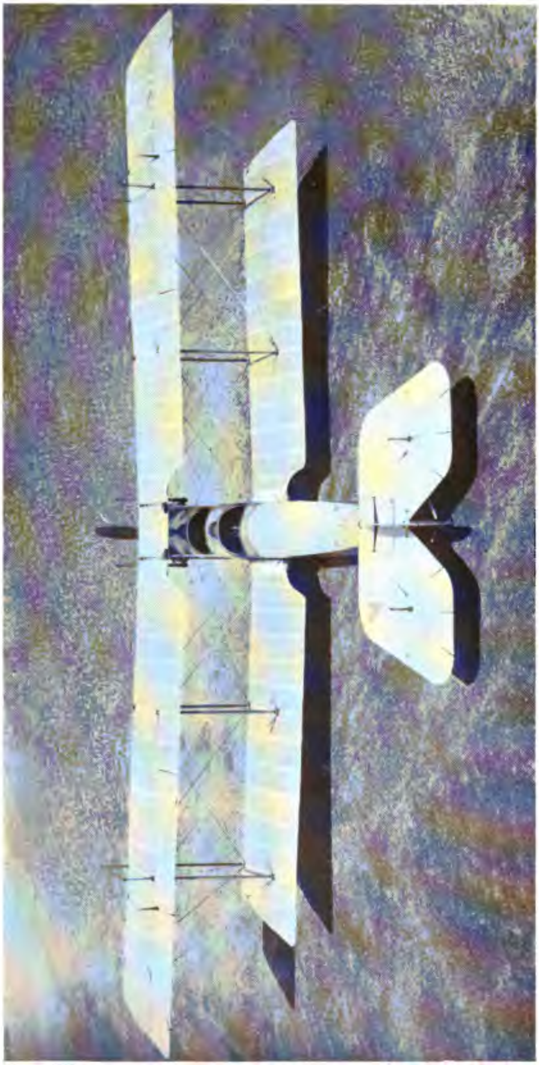

FIG. No. 2

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SPECIFICATIONS

CURTISS MODEL JN4-D MILITARY TRACTOR

GENERAL DIMENSIONS:

Wing Span—upper plane	43 ft., 7⅜ in.
Wing Span—lower plane	33 ft., 11¼ in.
Depth of Chord	59½ in.
Gap between Planes	60 in.
Stagger	16 in.
Length of Machine, overall	27 ft., 4 in.
Height of Machine, overall	9 ft., 10⅝ in.
Normal Angle of Incidence of Panels	2 degrees
Dihedral Angle	1 degree
Sweepback	0 degree
Angle of Incidence of Horizontal Stabilizer	0 degree

AREAS:

Upper Planes*	167.94 sq. ft.
Lower Planes*	149.42 sq. ft.
Ailerons (each 17.6 sq. ft.)*	35.20 sq. ft.
Horizontal Stabilizer	28.70 sq. ft.
Vertical Stabilizer	3.80 sq. ft.
Elevators (each 11.00 sq. ft.)	22.00 sq. ft.
Rudder	12.00 sq. ft.
Total Supporting Surface*	352.56 sq. ft.

WEIGHT:

Net Weight, machine empty	1430 lbs.
Gross Weight, machine loaded	1920 lbs.
Useful Load:	490 lbs.

Fuel (21 U. S. Gals.)	130.0 lbs.
Oil	30.0 lbs.
Pilot	165.0 lbs.
Passenger	165.0 lbs.
Total	490.0 lbs.

Loading per sq. ft. Supporting Surface	5.45 lbs.
Loading per R. H. P.	21.35 lbs.

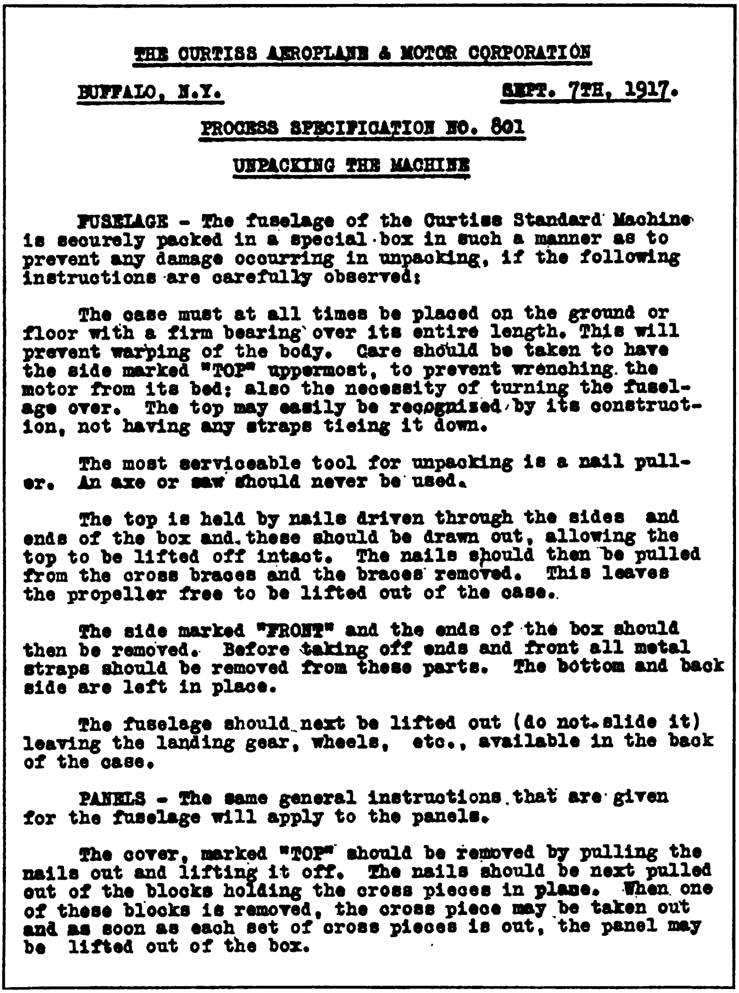
PERFORMANCE:

Speed, maximum, Horizontal Flight	75 miles per hr.
Speed, minimum, Horizontal Flight	45 miles per hr.
Climb in 10 minutes	2000 ft.

MOTOR:

Model OX-5, Vee, Four-Stroke Cycle, 8-cylinder, water-cooled.

Horsepower (rated at 1400 R. P. M.)	90
Weight per R. H. P.	4.33 lbs.
Bore and Stroke	4 in. x 5 in.
Fuel Consumption per hr.	9 gals.
Fuel Tank Capacity	21 gals.
Oil Capacity provided in Crankcase	4 gals.
Fuel Consumption per B. H. P. per hr.	0.60 lbs.
Oil Consumption per B. H. P. per hr.	0.03 lbs.



THE CURTISS AEROPLANE & MOTOR CORPORATION

BUFFALO, N.Y. SEPT. 7TH, 1917.

PROCESS SPECIFICATION NO. 801

UNPACKING THE MACHINE

FUSELAGE - The fuselage of the Curtiss Standard Machine is securely packed in a special box in such a manner as to prevent any damage occurring in unpacking, if the following instructions are carefully observed:

The case must at all times be placed on the ground or floor with a firm bearing over its entire length. This will prevent warping of the body. Care should be taken to have the side marked "TOP" uppermost, to prevent wrenching the motor from its bed; also the necessity of turning the fuselage over. The top may easily be recognised by its construction, not having any straps tieing it down.

The most serviceable tool for unpacking is a nail puller. An axe or saw should never be used.

The top is held by nails driven through the sides and ends of the box and these should be drawn out, allowing the top to be lifted off intact. The nails should then be pulled from the cross braces and the braces removed. This leaves the propeller free to be lifted out of the case.

The side marked "FRONT" and the ends of the box should then be removed. Before taking off ends and front all metal straps should be removed from these parts. The bottom and back side are left in place.

The fuselage should next be lifted out (do not slide it) leaving the landing gear, wheels, etc., available in the back of the case.

PANELS - The same general instructions that are given for the fuselage will apply to the panels.

The cover, marked "TOP" should be removed by pulling the nails out and lifting it off. The nails should be next pulled out of the blocks holding the cross pieces in place. When one of these blocks is removed, the cross piece may be taken out and as soon as each set of cross pieces is out, the panel may be lifted out of the box.

Fig. No. 3

THE CURTISS STANDARD JN4-D MILITARY AEROPLANE HAND BOOK

1. UNPACKING

The experiences of several schools in unpacking aeroplanes and the accessory parts, have been the cause for carefully planning the shipping cases and furnishing explicit "Unpacking Instructions." These are reproduced in facsimile Fig. No. 3 on the opposite page. Read the instructions carefully before *dismantling* box.

The component parts of the standard JN4-D are packed for shipment in two cases. The case is designated by the name of its major contents, as:

(1) Fuselage.
(2) Panels.

The contents of these boxes are noted on the packing sheets. Sample packing sheets are illustrated in Figs. No. 22 to No. 27.

(1) The fuselage contains the motor set in place; the instrument board and instruments all connected up; the carburetor control and adjustment; throttle controls; and magneto cut-out switches, all connected up and ready for operation; and the tail skid in place. The control sticks are in place. The leads attached to segment of the stick control for operating the ailerons, will be found wrapped around the seat rails; the leads for controlling the elevators will be found attached to the control walking beams with ends passed

through the fairleads and coiled up in the fuselage back of the pilot's seat. The rudder control wires are attached to the foot control bar, and leading to the rear end of the fuselage cover, are coiled up ready for leading through the fuselage for attachment to the rudder.

The landing gear, completely assembled without the wheels, and with the cross-stay wires connected up but slack, is also packed in this case. The wheels of the landing gear, the propeller and exhaust equipment will also be found in this box.

(2) The panel box contains all the panels with sockets and hinges all attached. The transverse and longitudinal wires will be found attached to the under side of the upper wing, coiled up and ready for attaching to the lower wing. The aileron control pulleys are all in place on the under side of the upper wing; the aileron control cables are passed through these pulleys and coiled up—shackles and pin at one end for attaching to the control pylons of the aileron, and turnbuckles at the other end for attaching to the "lead" coming from the stick control segment and through the side of fuselage. This case also contains the elevators and rudder, with control or operating pylons removed. All the control or operating pylons for the ailerons, elevators and rudder are packed in this case. Also, all the panel struts and engine section struts are packed in this box. The details of contents are given in the packing lists, marked "Panels," see Figs. No. 22 and 23.

2. HANDLING

In handling and hoisting these shipping boxes, care should be taken when using a sling that the center of the lift comes somewhat ahead of the center of the box toward the motor end. This point can be quickly determined by trial, by lifting the bridle until the box rides level. See Fig. No. 4.

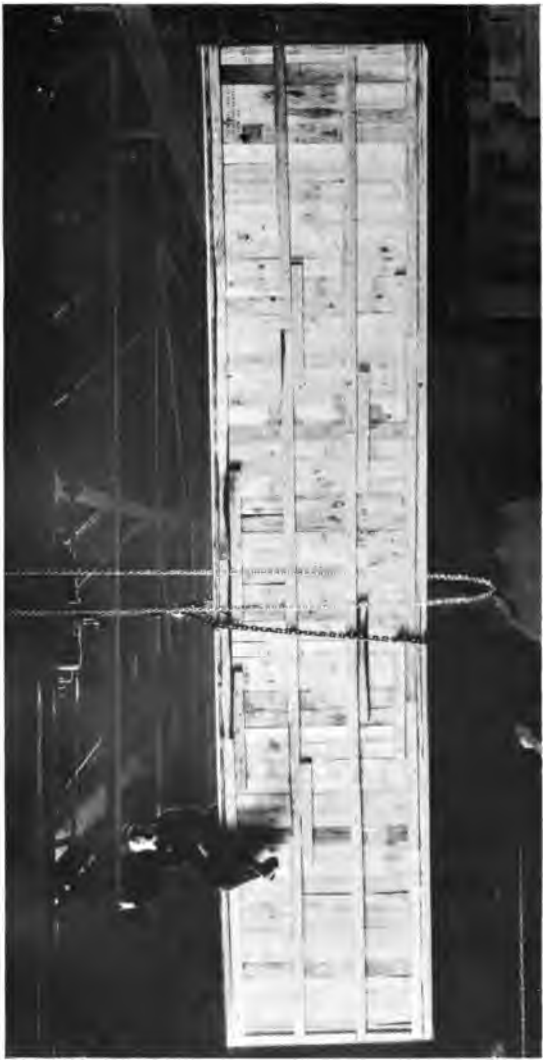


Fig. No. 4

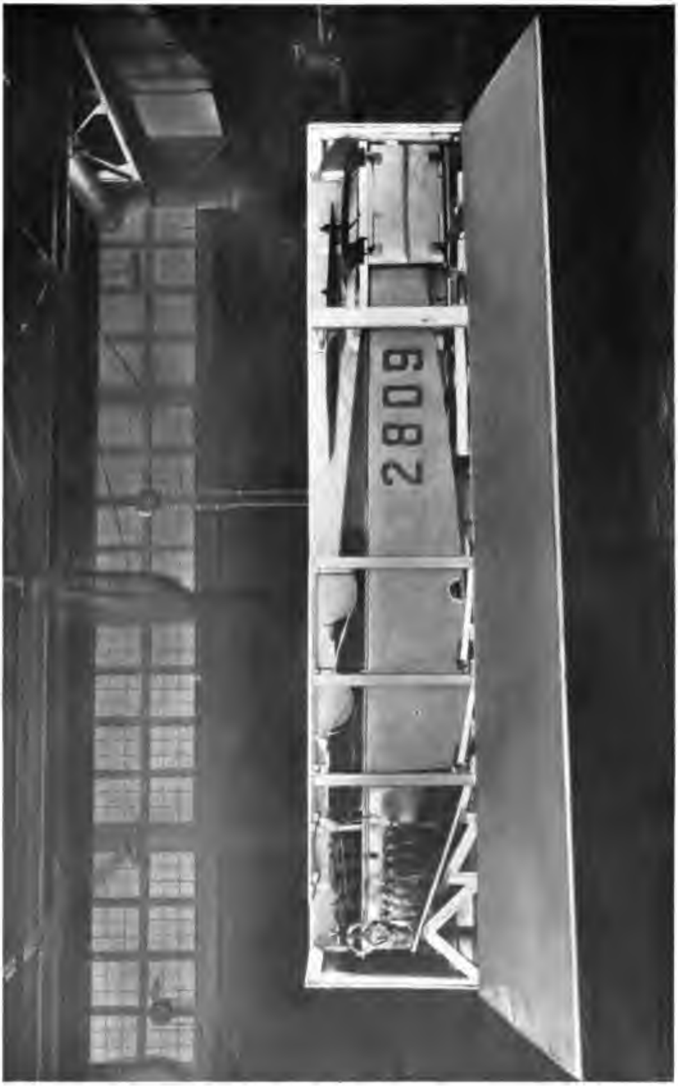


FIG. NO. 5

3. OPENING BOXES

The case should be placed on the ground or floor, on a firm bearing over its entire length. *Care should be taken to have the part marked "Top" uppermost.* This will avoid the possibility of wrenching the motor from its bed; also the necessity of turning the fuselage over. The top may be readily recognized by the construction: not having any metal straps tying it down. The top should be carefully pried loose with a crow-bar or similar tool. Then carefully remove the side and ends of the box. The bottom side and temporary struts of the packing case are left in place under the fuselage until ready to assemble the running gear in place.

The general arrangement of the various parts in the fuselage packing case is shown in Fig. No. 5. This view should be carefully studied before removing any portions of the box. The disposition of the accessories and unassembled members will thus be made obvious.

The propeller, wheels and other parts packed in this case should be removed from the members of the packing case to which they are secured.

Before opening the panel boxes, provision should be made for supporting the panels, either in cradles or on horses, or on soft felt pads. The latter method is most convenient if cradles are not handy. The panels may thus be placed on their "leading edge" and supported between uprights fastened to the floor or ground. Exercise extreme caution in opening the panel boxes, that the decking is not splintered or forced into the panels in the box. Remove all the nails from the top-side edge of the boxes, thus avoidiug the possibility of tearing the panels when they are removed from the box. Do not force any members from the shipping case. Remove the side walls, if there is any evidence of a tight fit. It is safer to break the packing case than to strain a flying unit.

4. EXAMINATION OF PARTS

A set of assembly drawings are incorporated in each fuselage box. Study these drawings carefully before commencing any erection operations. Identify each part as taken from the boxes, by comparison with the erection-prints. Each member that is packed separately from the unit of which it is a part is tagged with an identification part number. Assemble all such units before proceeding with the general erection of the machine. The shipping boxes are designed to facilitate secure shipment of the component parts. If the "Unpacking Instructions" are followed, the possibility of injury to the members will be reduced to a minimum. Every portion of the machine, before shipment, is thoroughly inspected and checked. *However, before attempting erection and truing up, go over every portion of the aeroplane and note:*

(*A*) FUSELAGE

1. That no members are bent out of alignment or broken;
2. That no wires are kinked or excessively slack. The fuselage is shipped with the trussing in a trued-up condition; the hard wires should be taut. All turnbuckles fitted to these wires should have the safety-wiring intact;
3. That no bolts in the trussing fittings are loose or unlocked:
4. That the flexible cable leads are not kinked or the stranded construction of the cable worked open. These leads are coiled up out of the way, and should not be loosened until ready to connect up to the control surfaces;
5. That no bolts or locking devices required for completing the erection are missing. These bolts are in

place, either in the fitting to which connection must be made; or are packed in a small bag in the box at the front of the fuselage packing case. Examine all bolts to insure that the threads are not burred. Fit the nuts to the bolts to check the mating and turning;

6. That no exposed portions of fittings required for alignment with the other members are bent out of alignment or damaged;
7. That all motor and instrument connections are tight or properly made;

(*B*) PANELS AND TAIL SURFACES

8. That the surfaces are not broken or torn;
9. That the units are comparatively tight and not subject to warping or being easily bent out of alignment. This is important since these members are covered and injury to the internal structure cannot readily be detected by direct methods. A considerable degree of rigidity may be expected in the plane of the trussing if all members are in alignment and not damaged, overstressed or slackened;
10. That all fittings on these surfaces are tight and all bolts properly locked;
11. That all the flying, landing and cross-bracing cables are intact, not kinked nor loosened in the strand construction of the cables;

(*C*) GENERAL

12. That all the necessary units for completing the assembly are present. This may be accomplished by checking off the various members, as noted on the packing sheets which are attached to each box.

The following blue-prints are shipped in each fuselage packing box:

TABLE No. I

Drawing No.	Name of Drawing	Details
16200	Erection Front Elevation	General Dimensions
16201	Erection Side Elevation	General Dimensions
16202	Erection Plan	General Dimensions
14754	Fuselage Wiring Diagram	Fuselage, Fuselage Wires and Braces
15180	Wing Wiring Diagram	Landing and Flying Wires
16195	Control Wiring Diagram	Control Sticks, Control Lines to Rudder, Elevators and Ailerons.
15130	Fittings Assembly	Wing Fittings
16196	Stick Control Erection	Seats, Control Sticks, Rudder Bar, Control Lines
15860	Motor Control Diagram	Gasoline Tanks, Gasoline Controls, Throttle Controls
11842	Tail Erection	Rudder, Vertical Stabilizer, Horizontal Stabilizer, Elevators, Tail Skid
16640	Fuselage Erection	Fuselage, Landing Gear, Cowls, Fuselage Cover, Seat, Controls, Tail Skid
5114	Landing Gear Assembly	Tire, Wheel, Axle, Shock Absorber, Landing Gear Struts.
15020	Motor Control Piping Diagram	Gasoline Piping, Oil Piping, Water Piping

5. GENERAL CONSTRUCTION OF JN4-D

(*A*) Panels

The contour of the wing curve is cambered according to the type known as the Eiffel No. 36. The chord for the general wing curve section is 59½ inches. The upper plane is built in three sections; one central engine-section panel,

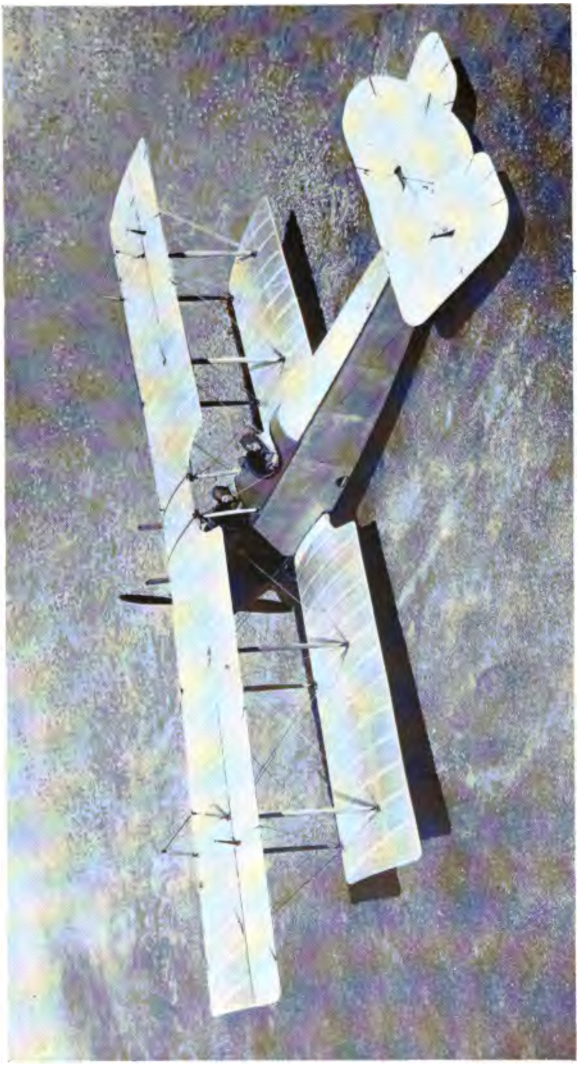


FIG. No. 6

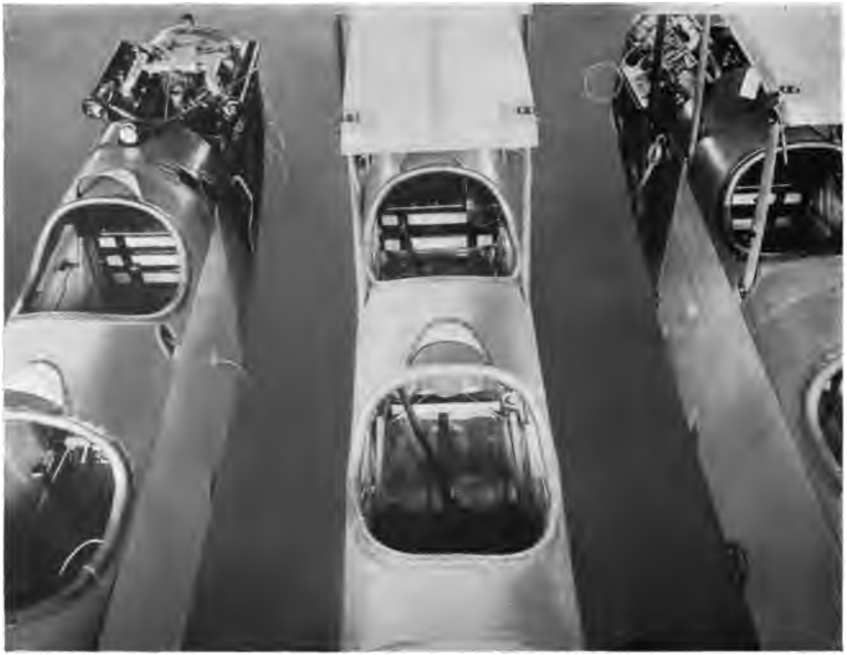


Fig. No. 7

and two side sections; one on each side of the engine section. The lower plane is built in two sections; one on each side of the fuselage. The engine section is designed for the width of the fuselage. In both the upper and lower panels, adjacent to the engine section and fuselage respectively, the rear portion of the panels are cut away to a smooth ogee-shaped curve, to enlarge the range of vision above and below. The engine section extends to the rear beam only, and has no overhang beyond the rear beam.

(*B*) INTERNAL TRUSSING OF PANELS

The internal truss system of the panel is composed of tension diagonals and compression struts. The tension diagonal members which are designed to take the stresses induced in flight, are in duplicate. All fittings for fastening these members are so attached to the beams, which form the transverse members of the internal truss, that the failure of the attachment of one such member or diagonal, does not cause a loosening or failure of the attachment of the duplicate member. The diagonal members taking the stress due to landing are single members. The adjustment of the tension in all the diagonal members is accomplished by means of turnbuckles, fitted to the end of the member. The turnbuckles fitted to the duplicate arranged members are so disposed that one wire is adjusted at the front beam and its duplicate member is adjusted at the rear beam. The turnbuckle on the diagonal members taking the landing stresses are generally located at the front beam terminals. The internal compression members conform to the cross-sectional contour of the panel. These members are solid in section and not lightened. Cap-strips passing over the upper and lower surfaces of the front and rear beams securely maintain all truss (solid) and intermediate (lightened) ribs longitudinally in alignment. All ribs conform to the cross-sectional contour of the panel.

(*C*) COVERING

The main panels are covered on the upper and lower surfaces with fabric. This covering is machine sewn at the seams; this being of the type known as the lap-seam. In this construction each strip is lapped over at the edge to be sewn. The two strips are so brought together that the lapped edges meet: thus in the upper strip the lap is folded downward, while in the lower strip the lap is folded upward. The thread passes through three pieces of linen in sewing the seam.

The fabric is carefully stretched over the framework of the panel. The tension applied to the linen, as necessary for smooth covering, is directed parallel to the span of the panel. Care is taken not to apply this tension in the direction of the chord, so that when the dope on the linen contracts, it does not alter the wing curve.

In laying the linen covering on the panel the seams are placed diagonally to the fore and aft direction. The fabric is hand sewn on two sides to the panel frame.

For sewing the fabric to the ribs, Andover No. 7 harness-maker thread, properly waxed is used. This thread is taken around each rib, each stitch being properly locked with a knot. The stitches are 4 inches apart.

The fabric is tacked to the frame at those points around the side hinges and similar locations where it is impossible to fasten by sewing.

After the fabric has been sewn to the frame, a strip of aeroplane linen, 2¼ inches wide, with the threads frayed at the sides ⅛ inch, is doped over the stitches.

(*D*) INTERPLANE TRUSS

The bracing between the upper and lower panels consists of two transverse trusses in the planes of the front beams and rear beams respectively, and continuous from the fuselage to the outer ends of the panels. The vertical members are designed for compressive stresses; the diagonal members for tension stresses. The diagonal members are aligned in opposite directions to withstand any reversal of stresses. The front beams of the upper and lower panels constitute the upper and lower chord members of the front truss. The rear beams similarly constitute the chord members of the rear truss. The trusses are symmetrically disposed with respect to the longitudinal plane of symmetry of the aeroplane. The trusses are crossbraced with tension diagonal members attached to the panel (strut) points.

Flying wires between the wing posts are in duplicate. Their attachments and fittings to the front and rear beams are also in duplicate. Each wire and its attachment is of sufficient strength to take the whole designed load with the factor of safety.

The landing wires between the wing posts are single.

The engine section wires are designed for their full load at the given factor of safety.

The transverse wires between the upper and lower planes are single cables in both directions.

Drift wires to both the upper and lower planes are single cables. The front drift wire is attached at its forward terminal to the nose of the machine and at its rear terminal to the lower socket plate of the front intermediate wing post. The rear drift wire is attached at its front terminal to the nose of the machine and at its rear terminal to the upper socket plate of the rear intermediate wing post.

Mast wires, both front and rear, inner and outer, are single cables.

All these cables are galvanized, non-flexible, 1 x 19 strand.

The sizes of these cables are in accordance with the Wing

Wiring Diagram, C. A. Co., Dwg. No. 15180. (See Table No. I.)

All interplane wires have a turnbuckle fitted at one end and a shackle at the other end, or directly attached to the head of an eye-bolt. The connections of the shackles to the fittings are made by means of pins which are locked by cotter pins.

(*E*) AILERONS

Ailerons are fitted to the rear beam in the recessed section of the upper panels, at their outer ends. The trailing edge (integral with the outer end edge) of the aileron is parallel to the leading edge. The end edge of the aileron is continuous in the same line with the panel outer end edge.

The cross sectional contour of the aileron conforms to the lines of the wing curve from the rear beam to the trailing edge.

The control braces of the aileron are equipped with hard wire guys to free them from any bending stresses. These braces are securely bolted to the ailerons. The guy wires are fitted with turnbuckles.

The ailerons are fitted at their trailing edge with suitable sheet steel clips, bolted in place, for the attachment of the elevator brace guy wires.

(*F*) FUSELAGE

The fuselage consists of two side trusses, continuous from the nose of the machine to the tail. The vertical web members are designed for compressive stresses; the diagonal members for tension stresses. The diagonal members are aligned in opposite directions to withstand any reversal of stresses. The longerons constitute the upper and lower chord members. The upper longerons are horizontal and parallel to the line of thrust, from the point of maximum depth of the truss to the tail. The alignment of the lower longerons is curved to conform to the required streamline formation.

The side trusses are symmetrically disposed with respect to the longitudinal plane of symmetry of the aeroplane and gradually taper towards this plane, meeting at the tail post.

The trusses are braced in a horizontal plane at the upper and lower longerons. The members of this bracing, perpendicular to the longitudinal axis, are designed for compressive stresses. The diagonal cross members are designed as tension members and aligned in opposite directions to withstand any reversal of stresses.

The main trusses are further braced at each panel point abaft the pilot's seat by crossed diagonal tension members in a vertical plane perpendicular to the plane of symmetry.

From the nose of the fuselage to the station abaft the pilot's seat the diagonal tension members are non-flexible cable. Abaft the pilot's seat all diagonal tension members in both the vertical and horizontal planes, and cross bracing are single members of hard wire. The diagonal tension members are connected to the fittings on the longeron which receive the compression struts. These tension diagonal members are attached to the fittings by either a turnbuckle or a shackle.

The compression members are solid struts framing between the longerons. The cross section of these struts is generally square.

(*G*) TAIL ASSEMBLY

The horizontal stabilizer, vertical stabilizer, rudder and elevators are assembled in accordance with the C. A. Co.'s Dwg. No. 11842. (See Table No. I.)

The horizontal stabilizer is mounted at the rear end of the fuselage with its lower surface resting on the top edge of the upper longerons. It is further braced and anchored to the fuselage in a fore and aft direction by a system of struts arranged from the under side of the stabilizer to the lower longerons and tail post.

The vertical stabilizer is mounted on the upper centerline of the horizontal stabilizer to which it is anchored by suitable clips and tie-down cables.

The rudder is suspended from the end edge of the vertical stabilizer and tail post of the fuselage. The guy lines from the control braces to the trailing edge are so arranged as not to foul the elevators for any position of operation. The upper edge of the rudder is in a continuous line with the leading edge of the vertical stabilizer.

The elevators are mounted on the trailing edge of the horizontal stabilizer. The inner edges of the elevators are arranged to permit operation of the rudder through an arc of at least 30 degrees each side of the fore and aft center line.

Covering and doping is the same as for the panels.

(*H*) LANDING GEAR

The landing gear is of the "V" type cross-braced construction. It consists of two trusses, suitably separated and cross-braced. The lower ends of the members of each side truss terminate in the fittings of the continuous cord shock-absorber bridge. The landing gear is fastened to the lower longerons with suitable fittings.

The axle is properly streamlined. The bridge is so aligned vertically as to permit an upward and downward movement of the landing gear axle.

The shock absorbing bridge is of the type known as the continuous rubber cord shock absorber.

The shock absorbing unit of the bridge is a continuous built-up rubber cord covered with fabric. This cord is securely wound around the axle saddle which passes through

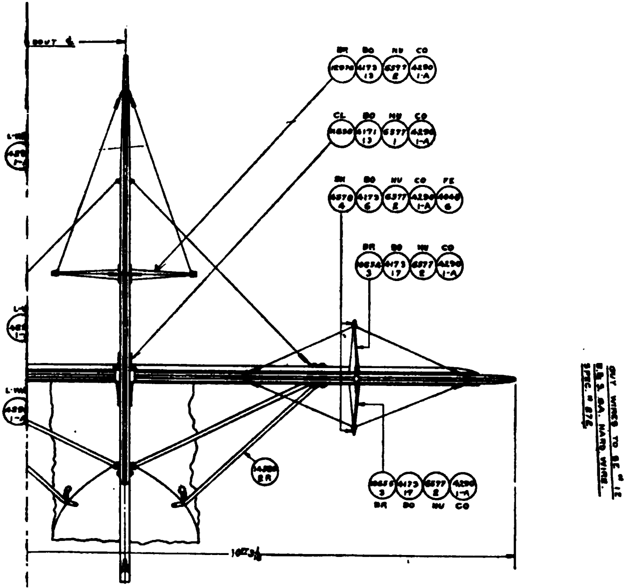


FIG. 8

rs in circles refer to the C. A. Co.'s part-numbers for and should be used when referring to these parts. resent the following:

P I=Pin
T U=Turnbuckle
C O=Cotter-pin
F E=Ferrule
P L=Plate
T E=Terminal

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the steel bridge and rests over the axle on both sides of the struts.

The bridge proper is a lightened steel member with a slotted arrangement to permit the vertical movement of the axle. This guide for controlling the vertical movement is curved in a transverse direction to accommodate the vertical rotation of the axle about one wheel in case of a side-landing.

(*I*) CONTROL SYSTEMS

The three-directional control of the machine is centered in each cockpit, and arranged to operate as an interlocked system. The directional controls in the two cockpits are identical, with the exception that the aileron quadrant, mounted on the tubular fore and aft axis between the two cockpits, is located in the rear only. Under normal conditions of flight, the controls are arranged to operate in the standard and universally accepted directions: a forward movement of the stick beyond the neutral point will cause the elevators to drop and the machine to dive; conversely, a rearward movement of the stick beyond the neutral point will cause the elevators to rise, and the machine to mount. The sticks are connected by a horizontal tubular link. (See Fig. No. 9.) From the rear stick aft, there extends another link that terminates in a universal ball and socket joint with the lever which operates the axis on which the elevator control "walking-beams" are fastened. The elevators are direct connected to these walking beams by means of flexible cable.

The movement of the stick to either side of the fore and aft axis operates the ailerons. The stick in each cockpit is permanently fastened with respect to any lateral motion to the main fore and aft tubular axis of the control system. At the rear end of this shaft or axis, is permanently fastened the aileron-control-quadrant. Any side movement of the stick causes an equal angular movement in the quadrant. The aileron control lines are looped around, and fastened at one point to the quadrant.

The rudder is operated by the *foot-bar type control* which is direct-connected and operating.

The ailerons, rudder and elevators are all equipped with control braces. These braces are located at or near the hinge line of the member. The braces are equipped with sufficiently large bases to distribute the compressive stresses developed in this member. Sufficient hard wire guy lines run from the upper end of the control braces to the trailing edge of the member to be controlled.

These braces are made of sheet steel, hollow construction and so arranged that the axis of the control column is approximately normal to the direction of pull. The control braces are arranged in pairs on opposite faces of the member to be controlled, and are fastened to the member and to themselves in pairs, by bolts which pass simultaneously thru the members and the bases of the control column.

The top or upper end of the braces are reinforced. The cross-section of these braces are of a general streamline shape.

The general arrangement of the control lines and operating surfaces is shown diagrammatically in the C. A. Co.'s Dwg. No. 16195. (Fig. 9.)

6. LANDING GEAR ASSEMBLY TO FUSELAGE

The landing gear (Part No. 5114; also see drawing No. 16201) is assembled by mounting the wheels on to the axle, and bolting wheels in place with bolts No. 4172 and accompanying nuts and cotters. The fuselage should now be elevated to receive the landing gear. This may be accomplished in one of two ways—either by tackle, or by shims and blocking.

(*a*) If block and tackle are used to raise the fuselage, pass a line under the engine bed supports or sills (Part No. 11741;

see Drawing No. 16650) just to the rear of the radiator. To this line attach hook of block. Do NOT ATTACH LIFTING DEVICE IN ANY OTHER MANNER, TO AVOID DAMAGING OR CRUSHING SOME PART. With the fuselage now resting on blocking location under the fuselage, just ahead of the tail skid, and under a vertical member of the fuselage side-trussing, lift the front end until the lower longeron clips for attachment of landing gear struts clear the landing gear. These clips on the lower longeron for connecting the front struts of the landing gear are found at Station No. 3 (see Drawing No. 4877). The clips on the lower longeron for connecting the rear struts are found at Station No. 5 (see Drawing No. 4182). The short bolts, with lock-washers, nuts and cotters, are found in the clips attached to the bottom longerons at Station No. 3 and Station No. 5. The lock-washers are put under the head of the bolt, and when the clips on the longerons line up with the clips on the ends of the struts of the landing gear, these bolts are passed down through the holes thus aligned. This places the nuts on the down side of the connection, thus facilitating assembling and inspection of connections. The castellated nuts are then put on the bolts and drawn up tight, until the drilled hole in the bolt is visible through the castle of the nut. Then insert cotter pin and spread the two leaves backward, and in opposite directions, over the nut. This locks the nut in place. When the landing gear has been completely assembled to the fuselage, the tail of the machine should be elevated and supported by a horse and blocking under Station No. 10 (see Drawing No. 16640, also Fig. No. 13), until the upper longeron is level. This can be determined by placing a spirit level on the upper longeron, between Station No. 10 and No. 12, at the tail. (See Fig. No. 13.)

(*b*) The other method that may be employed for raising the front end of the fuselage, to assemble the landing gear,

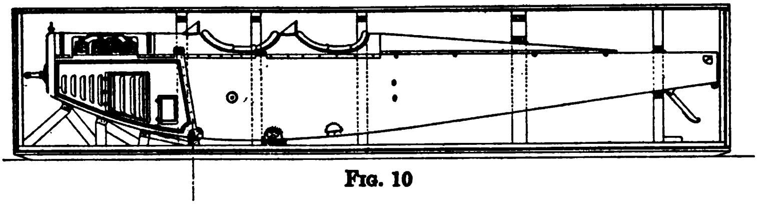


Fig. 10

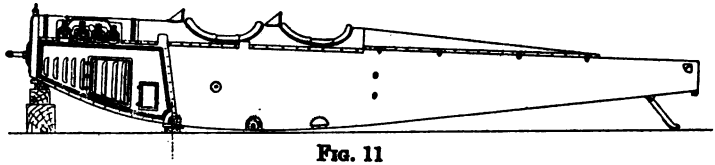


Fig. 11

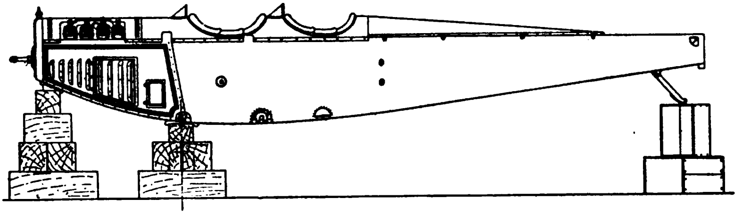


Fig. 12

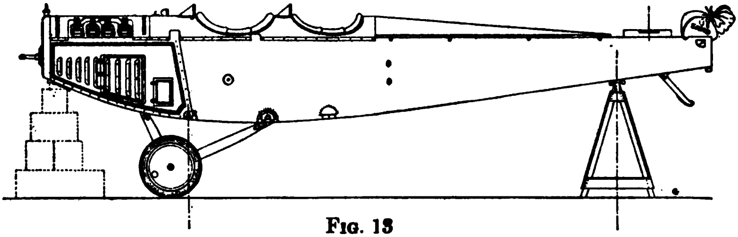


Fig. 13

is the following: remove the shipping blocking and front flooring of shipping case from under the fore part of the fuselage. Insert a block under the bottom longerons at Station No. 4, thus coming ahead of the point on which the fuselage is resting, as shipped. This blocking should be aligned under the vertical strut (see Fig. No. 11). The flooring to the rear of the blocking should now be removed. By lowering the tail, the nose of the machine is elevated, the above mentioned blocking serving as a fulcrum. Block up under nose of machine, placing blocking under RADIATOR-BRACKET, AND NOT UNDER RADIATOR (see Fig. No. 11). If the tail of the machine be now lifted, this nose blocking serves as a fulcrum, and the fuselage at Station No. 4 will clear the blocking at that point. Block up again with wedges under Station No. 4 until blocking is tight against lower longeron (see Fig. No. 12). By depressing tail of machine, the nose will again be elevated so that the blocking there will now need to be increased. By this alternating method of changing the fulcrum point and increasing the blocking, the nose of the machine can ultimately be blocked up sufficiently high (with tail of machine on the ground and blocking at Station No. 4 removed) that the landing gear may be assembled to fuselage, Fig. No. 13. A horse placed at Station No. 10, while the nose blocking is in place, will permit the removal of the blocking under Station No. 4, and allow the placing of the landing-gear under the fuselage. See Fig. No. 13.

7. HORIZONTAL STABILIZER (Part No. 11627)

After the upper longeron is leveled up, the horizontal stabilizer (Part No. 11627) is assembled to the tail of the fuselage. From Drawing No. 16202 (plan view) and No. A (Fig. No. 8) the disposition of this member is shown. Each upper longeron has one U bolt and one special bolt to fasten down the horizontal stabilizer. The U bolt is just ahead of Station

No. 10, passing under the longeron with the legs pointing upward. These bolts extend through the stabilizer and are fastened by means of nuts, serving as a means for holding the leading edge of the stabilizer.

At the tail of the machine, two special bolts are arranged so that they extend through the horizontal stabilizer, at Station No. 12, one on each side of the vertical stabilizer. These bolts also extend through a small metal, L-shaped piece on each side, which is fastened to the vertical stabilizer, thus fastening both vertical and horizontal stabilizers to the tail of the fuselage. These two bolts are flattened on their lower ends so that they rest against the tail post and are held to it by one bolt running through, and two screws, one on each side. All nuts are castellated and secured with cotter pins.

8. VERTICAL STABILIZER (Part No. 13068)

The vertical stabilizer is now fastened to the horizontal stabilizer:

(1) By means of the bolts which pass through the forward and after parts of the horizontal stabilizer, and

(2) By means of the hard wire stay lines running from the top of the vertical stabilizer to the upper surface of the horizontal stabilizer (see Drawing No. 11842). The forward bolts pass through the clip at the lower front point of the vertical stabilizer. The bolts which are fastened to the tail post of the fuselage, and engage the after end of the horizontal stabilizer, also engage the lugs fastened to the bottom edge of the vertical stabilizer at the rear. Draw the nuts up tight and lock with cotter pins. The hard wire lines attached to the vertical stabilizer, and turnbuckles are used to align and tie down the vertical stabilizer.

9. RUDDER (Part No. 11659)

The control pylons or braces (Part No. 12976) are first attached to the rudder. These braces are so placed that the upper tips point toward the hinge line. In this fashion the holes will match up. The bolts and nuts for securing braces to the rudder are shipped and fastened to the braces. Before mounting the rudder the vertical stabilizer should be checked up, so that it is in plumb alignment with the tail post. This check is absolutely necessary to insure the absolute alignment of the hinges in the vertical stabilizer and the tail post. The rudder is now mounted onto the tail post and vertical stabilizer by means of the hinges. (See Drawings No. 16650 and 16201 for position and relations.) The hinge pins are now inserted in the hinges, and cotter pins passed through the drilled holes in the bottom of the pins. The cotter pins should be spread backward as usual.

10. ELEVATORS (Part No. 11582)

These are first equipped with the control braces (Part No. 10654), which, with the accompanying bolts, nuts and cotters, are found in the Wing Panel Packing Box. The position of the base of the control brace is indicated on Drawing No. 11842 (Fig. No. 8). These braces are also arranged so that the upper tips point toward the hinge line. The elevators are mounted to the horizontal stabilizer by means of the hinges and hinge pins. The hinge pins are kept in their bearings by the cotter pins, inserted through the drilled holes in the bottom of the hinge pins. The position of the elevators is shown on Drawing No. 11842 (Fig. No. 8).

11. PANEL ASSEMBLY

The panels are now to be assembled. Before the main panels can be connected to the fuselage, the engine section panel must be erected.

ENGINE SECTION PANEL (Part No. 14798): The engine section struts are first set into place into their sockets on the upper longerons. These posts are found packed in the

"Panel" box. The forward posts (Part No. 11967) are approximately held in place by the flexible wire lines to be found coiled up and temporarily fastened under the cowl in the motor compartment. The rear struts (Part No. 12733) are approximately held in place by the flexible wire lines leading from lower longeron, Station No. 7, and to be found tied to the control stick in the front cockpit. The engine section panel is now mounted on the struts, after the front transverse bracing, between the posts, is approximately trued up. The engine section panel posts and wires are then trued up prior to further erection. This condition is obtained by adjusting all "mated" or similar wires to the same length.

12. MAIN PANELS

The main panels are now to be assembled to the machine. There are two methods for accomplishing this:

(*a*) Assemble panels, struts and wires, before attaching to fuselage.

(*b*) Assemble the upper plane to the engine section, and complete assembly.

The first method is the most advantageous, since it permits the setting of the main panels at the approximately correct stagger and dihedral, and does not require as much subsequent adjustment as the second method.

(A) FIRST METHOD—Wings Completely Assembled

All the main struts will be found to bear a number. These numbers run from 1 to 8. The method used in numbering the posts is as follows: Starting as post No. 1, with the outer post on the left hand side of the pilot, as he faces his direction of travel, the front posts are numbered successively from No. 1 to No. 4: Nos. 1 and 2 being on the left side and Nos. 3 and 4 being on the right side. The rear posts are similarly numbered from No. 5 to No. 8: Nos. 5 and 6 being on the left

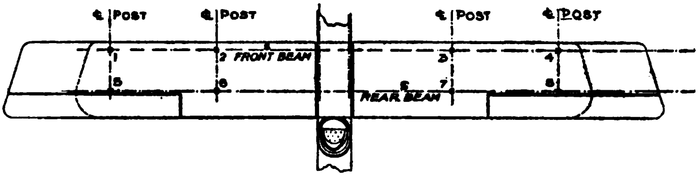


FIG. 14

NOTE.—The above figure shows the method used in numbering the interplane posts. The number is located on the inner face of the post, so that looking from the fuselage outward, in either side direction, the numbers can be read. This system insures the correct location of the posts and avoids turning a post up-side down. The outer left-hand post is marked No. 1, and the numbers run consecutively for all *front posts* (except engine-section posts). The rear outer left-hand post is given the next number consecutive to that of the front outer right-hand post. In this machine the front posts are numbered from 1 to 4 inclusive; the rear posts from 5 to 8 inclusive.

and Nos. 7 and 8 being on the right. This system of numbering does not include the engine section struts. Fig. No. 14 shows the system graphically.

The system of marking also insures that the struts are not inverted in their sockets. This is accomplished by painting the number on the strut, so that when viewed from the pilot's seat all numbers can be read; i. e., the numbers are painted on that side of the strut intended to face the fuselage, as diagrammatically shown in Fig. No. 14. If a strut be inverted by mistake, it can thus quickly be detected.

(1) The upper left wing panel (Drawing No. 14832) is first equipped with the front and rear masts by inserting the masts into their sockets on the upper surface of the panel. The mast wires are then connected up to the anchor plates, located on the upper surface to the right and left of the mast-socket. Adjust the tension in these wires, by means of turnbuckles, until the front and rear wing beams become straight, in a vertical plane.

(2) Stand the upper left wing panel and lower left wing panel on their "leading" or "entering" edges, properly supporting the panels in cushioned blocks to prevent damage to the nose. Space the panels apart, approximately equal to the length of the struts.

(3) Next connect up the diagonal cross wires. These must be loosely connected up (by loosening up the turnbuckles), to permit the easy entering of the posts into the sockets. The wires are connected before the posts or struts are set in place, since, with the latter in place, the connecting of the wires to the lugs of the sockets is accomplished only with difficulty. After these wires are thus connected, insert the posts and bolts into place.

(4) Connect up loosely the "landing" (single) wires and "flying" (double) wires of the outer bay to hold the wings together as a unit. The outer bay is thus completely wired, though but loosely.

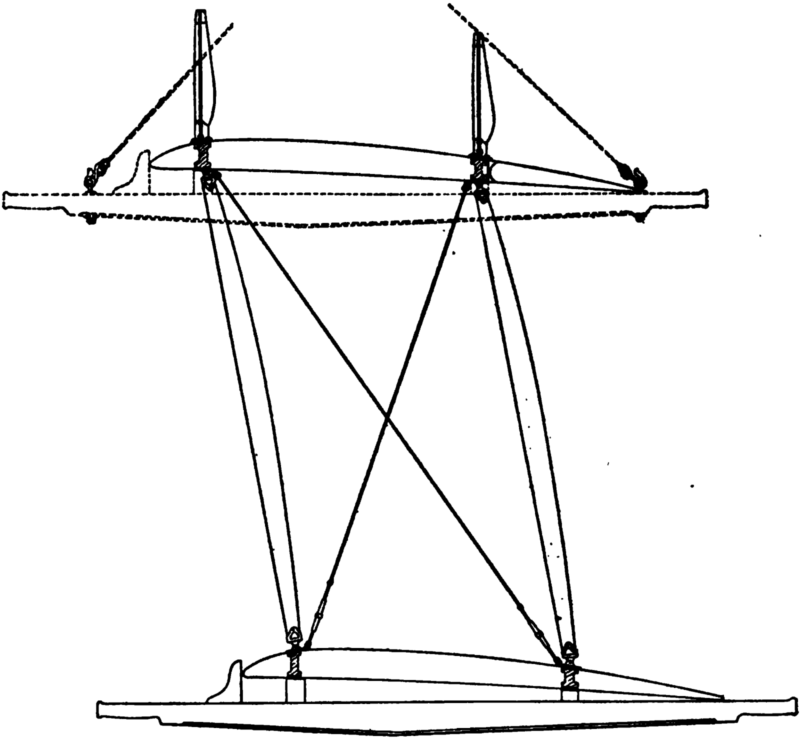


FIG. 15

NOTE.—If an overhead crane or telpherage system is at hand, the carrier can be used as shown by the dotted installation. The lower (illustrated) condition is convenient for hand transportation. One carrier should be inserted under each panel point of the wings (next to the interplane posts).

(5) The posts that are used for this left side are No. 1, No. 2, No. 5, and No. 6 according to the diagram. No. 1 is the outer front; No. 2 the inner front; No. 5 is the outer rear; No. 6 the inner rear.

(6) The wings, as above assembled, are now erected to the fuselage. Extreme care should be exercised in transferring the wings to the fuselage, not to strain or break them. In carrying the wings, use wooden boards placed under the wings, and block up under the wing beams (which can be easily located by the line of fittings attached) so that these take the strain of the load. Do not attempt handling assembled wings, using the posts as carriers, or by attachments to the trailing or leading edges. Fig. No. 15 shows a good manner in which the panels may be shifted.

The wings should be firmly supported temporarily by a suitable sling at the upper outer post point (not beyond this point), or by a horse, properly blocked under lower wing at outer lower post point (not beyond this point), during fitting of wing to machine. See Fig. No. 16 for arrangement. The wings will have the approximate stagger if assembled as above, since the posts are in place and the tension cross wires are adjusted to almost correct length when shipped. Insert the hinge pins through the hinges, located at ①, Fig. No. 16, as now coupled up.

ADJUSTMENT FOR DIHEDRAL

(7) The fuselage must now be leveled up transversely and longitudinally. A spirit level placed across the top longerons will determine the transverse condition. With the level placed fore and aft on the longerons aft of Station No. 5, the longitudinal level is established.

(8) Adjust the tension on the flying and landing wires until the dihedral of one (1) degree is established, also to make the leading and trailing edges parallel and straight. The amount

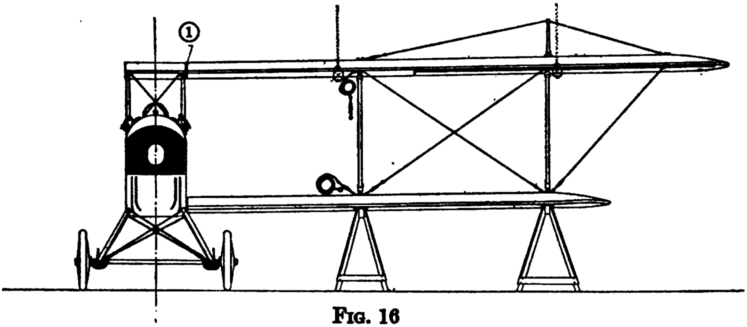


Fig. 16

Note.—If an overhead system of trussing is convenient, the slings shown dotted can be used during the temporary erection of the panels. Otherwise, the use of "horses" or other means of blocking under the lower panels, as shown, is imperative. This will avoid possible damage to the panel by the tipping over of the entire machine at this stage of erection.

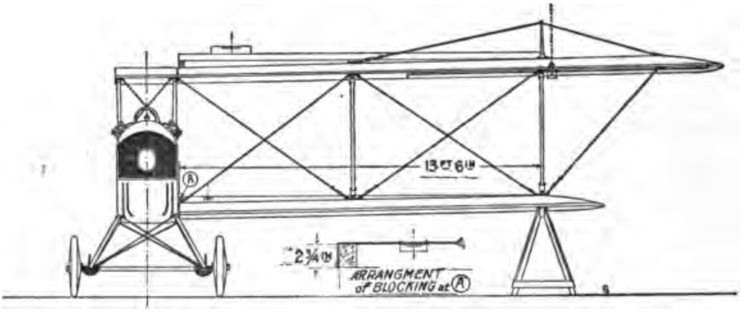


FIG. 17

NOTE.—During the adjustment for stagger and dihedral the rigging for supporting the panels must be maintained in place. Do not safety wire one side, until the opposite side has been erected. The machine will then be equally loaded on both sides. Go over the dihedral and stagger dimension to check up any possible change. When both sides agree with the specified values, safety wire all turnbuckles.

of lift for the one (1) degree dihedral is 2¾" in 13′ 6″ (distance from the inner edge of the panel to the centerline outer post). An easy method for checking the correct adjustment of the dihedral is to place a block 2¾" high on the upper surface of the lower wing, at the extreme inner edge. A straight edge resting on this block and on the upper surface of the wing (straight edge kept parallel to front or rear beam) should be level, Fig. No. 17.

This may also be checked by using a light spirit level, suspended from a string stretched over the given range. If a block 2¾" high be clamped to the inner edge of the panel, and a line pulled taut from this block to the centerline of the outer beam, the level suspended next to the block will be sufficiently sensitive to determine the required degree of dihedral. Fig. No. 17 shows the arrangement diagrammatically.

If the outer end of the wings is too high, the landing (single) wires are too short and the flying (double) wires are too long. Hence, loosening up equally on the inner and outer, front and rear flying (double) wires, will correct this condition. If the panels are too low (dihedral not up to one degree), reversing the above method corrects this condition.

ADJUSTMENT FOR STAGGER

(9) The tension in the longitudinal cross wires is now adjusted for stagger. The distance between a plumb line dropped from the leading edge of the upper wing and the leading edge of the lower wing should be 16 inches. If the amount is less than 16 inches, the line leading from the lower wing front socket to the upper wing rear socket is too long. Hence, drawing up on this line and lengthening out on the cross line will correct this condition. If the distance is more than 16 inches, reverse corrections of wire lengths (see Fig. No. 18).

(10) Check up the dihedral to see if this has been disturbed while setting stagger. Also check up with eye the alignment of the front and rear beam, and parallelism of leading and trailing edges. If these are not parallel, adjustment of the landing (single) wires in the inner bay (next to fuselage) will generally correct this condition.

(11) The wing skids on the under side of the lower wing should now be fastened to the sockets, directly under the outer posts.

(12) Bend all cotter pins out.

(13) The other side of the machine (right side) is then assembled in the same manner. Examine the left side to see that its adjustment has not been disturbed.

(14) Lock turnbuckles with safety wires. This latter is accomplished by first passing a soft wire through the eye of one shank of the turnbuckle, then winding the wire four to five times about the shank, the shorter, loose end of the wire being wrapped under the windings; then pass the free end through the small hole in the center of the barrel, then through the eye of the opposite shank, wrapping this free end around this shank and wire. This effectively locks the turnbuckles.

(B) SECOND METHOD OF ERECTING PANELS

The following outline method is given; the details of handling and adjusting of wires is identical with the details given for the first method:

(1) Insert masts (Part Nos. 5092, 5093) into sockets and connect mast wires to anchor terminals. Adjust tension of mast wires until beams are straight.

(2) Connect upper panel to engine section and bolt upper end of struts into fittings.

(3) Jack up wing tip of upper panel so that lower panel can be connected.

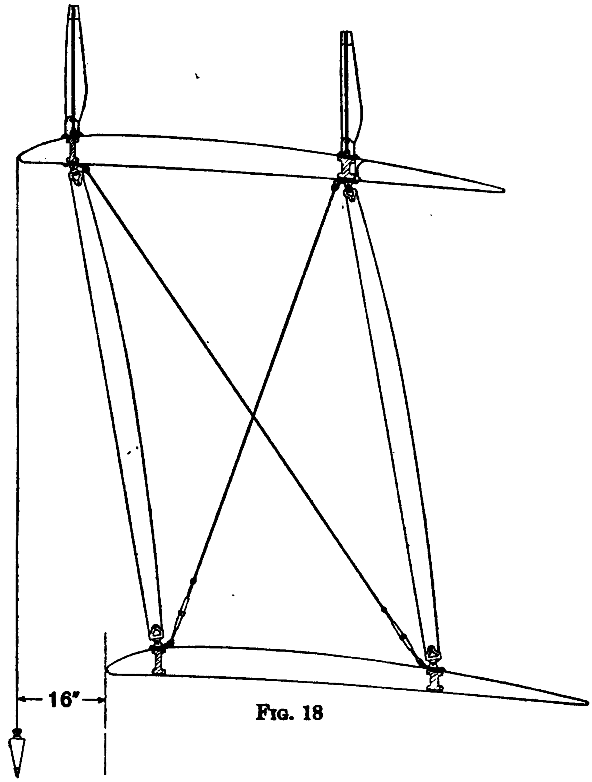


Fig. 18

Note.—The plumb line can be conveniently tied to the base of the wing mast on the upper panel. When checking the stagger at the inner end, the string may be attached to any of the upper panel upper surface fittings.

(4) Connect lower panel to fuselage.
(5) Connect cross diagonal wires.
(6) Bolt lower end of struts into fittings on lower wing.
(7) Connect landing (single) wires.
(8) Connect flying (double) wires.
(9) Proceed in like manner with other side of machine.
(10) Remove jacks and level fuselage longitudinally and transversely.
(11) Adjust tension on landing (single) and flying (double) wires until the dihedral is one degree; leading and trailing edges are parallel and straight.
(12) Adjust tension on diagonal wires until stagger is 16 inches.
(13) Attach wing skids.
(14) Bend cotter pins and safety wire turnbuckles.

13. AILERON ADJUSTMENT

Attach both ailerons (one on each side of machine, after having mounted control braces to ailerons) and fasten pins of hinges with the necessary cotter pins. Temporarily support ailerons so that their *trailing edges* are one (1) inch *below* the trailing edges of the upper panels. Then connect up the flexible tie-line that, passing over the top of the upper wings, through fairleads, is connected at the center by a turnbuckle, and, passing through pulleys attached to the upper surface, front beam, is attached (by shackle and pin) to the upper control brace of the aileron. This "lead" is allowed, so that when in flight, the force of the lift will somewhat raise *both* ailerons and bring their trailing edges on a line with the trailing edges of the panels. Now lead the end of the aileron control line attached to sector through the hole in each side of the fuselage (between front and rear seats). Uncoil the connecting line which passes over the pulley attached to the lower surface of the upper wing, near the front outer post.

Attach shackle and pin end to lower control brace of aileron, and attach turnbuckle end to loop of aileron control lead attached to control sector in fuselage (and which passes through side of fuselage). In making this last attachment, the leads should be so arranged (by moving the stick of the controls) that the lengths projecting through the fuselage are equal.

14. RUDDER CONTROL ADJUSTMENT

Uncoil the lines attached to the rudder bar, to lead out through the upper surface of the rear end of the fuselage cover, and, keeping the rudder control bar at right angles to the longitudinal axis of the machine, fasten the ends to the control braces. Next take up the slack of the lines, by means of the turnbuckles, adjusting the tension equally in each set; the rudder control bar (foot control bar) should remain at right angles to the longitudinal axis, when the rudder is neutral (or in a vertical plane through this fore and aft axis).

15. ELEVATOR CONTROL ADJUSTMENT

Temporarily maintain the elevators in the plane of the horizontal stabilizer (neutral position). Move the stick forward until the distance between the instrument board and the nearer surface of the tube of the stick is nine and one-half (9½) inches. By fixing this distance from the instrument board or dash to the tube of the stick, a slight lead is given to the control, for the greater range for raising the elevators. Now uncoil the wires leading from the clips attached to the walking beams of the stick control, and coiled up aft the pilot's seat. Pass the wire attached to the lower end of the beam out through the side of the fuselage, through the lower of the two vertical holes, aft of the pilot's seat. With the control stick lashed, or fastened to the nine and one-half (9½) inch position, connect this wire to the lower control brace of the elevator. Repeat operation for other side of machine.

Similarly the wire attached to upper end of the walking beam is passed through the upper hole in fuselage side, and attached to the upper control brace of the elevator. Drawing Nos. 16195, 16196, Fig. No. 9, shows the general arrangement of the controls. Adjust tension in these wires, by means of turnbuckles, so that all lines have the same degree of tautness. The elevators will then be neutral for this position of the bridge.

16. GENERAL

All connections having now been made, carefully go over each shackle, pin and turnbuckle, and see that all pins are properly in place, all nuts on bolts tight, and all cotter-pinned. Try out all controls for action and freedom of movement. See that no brace wires are slack, yet not so taut that, when plucked, they "sing."

Attach nose wires leading from nose of machine to intermediate posts, front and rear. The lower wire connects up with the lower front socket, on the upper surface of the lower panel; the upper wire connects up with the upper rear socket plate on the under side of the upper panel, after the panels are attached to fuselage, with stagger and dihedral properly corrected.

HINTS ON FLYING

RIGHT HAND TRACTORS

(1) Look over machine in general way.

(2) Be sure of gasoline, oil and water.

(3) Test motor for revolutions.

(4) Be sure controls are working properly.

(5) Start off full power directly into wind.

(6) Watch your direction carefully and counteract with right rudder the machine's tendency to turn to the left, due to the propeller's air blast striking the left side of fin more forcibly than the right side.

(7) After attaining a few feet headway, raise the tail with controls and keep it in this position to prevent machine from leaving the ground until it is well past its minimum flying speed, at the same time watching your direction carefully. If your course permits keep your machine on the ground until its maximum ground speed is reached. Then, very easily and smoothly, take it off the ground. By following the above plan of a high speed take-off a large degree of safety is assured, for if engine trouble develops soon after, you have surpassed the machine's minimum flying speed and you have a good chance to pick a landing spot that would not be possible if the take-off were made at slow speed, for the machine would immediately start sinking on loss of power and also lose its controllability to a large degree.

(8) The most dangerous place for engine failure is just after leaving the ground.

(9) When once under way it is advisable to attain a safe altitude as soon as possible, and it will be found that the best results can be attained by a high speed, low-angle climb rather than a slow speed, large angle. A steady, fast climb is the best for all purposes.

(10) After a height of not less than 800 feet, a turn can be

contemplated. It is advisable to reach a higher altitude if possible, but do not attempt one lower unless necessity demands to miss obstructions or to play safe on a certain forced landing spot in case of engine trouble.

(11) Never forget that the engine may stop, and at all times keep this in mind and plan on a safe landing place within gliding distance of wherever you may be. If you are still on the climb and wish to make a rather short turn, nose the machine over until you are flying level so as to keep the speed high. At the same time bring to play the rudder and ailerons in the correct proportions and in the proper directions to give a smooth, even turn. A large, easy turn with little bank is more to be encouraged than short, sharp ones, using a steep bank, for if banking is not properly done either skidding or side-slipping develops, both of which, if carried too far, are very dangerous. At no time let your machine attain a high angle of climb, for in so doing you are encouraging it to stall which would necessitate considerable altitude to recover from safely. At all times remember that although you are controlling the actions of the machine it has a considerable amount of stability itself, and be a little free with the controls rather than stiff and rigid.

(12) Do not at any time jerk the controls, but be firm and steady and above all smooth in their operations. This forms a quiet and confident mind which is invaluable in flying, also it reduces the strains on the machine to the minimum. Now that a safe altitude has been reached your anxiety diminishes, for with height there is safety; but remember to keep within gliding distance of a landing place.

(13) Directions of wind here enter on the gliding possibilities of your machine, for although at all times you go the same rate of speed through the air your relations with the ground change with the wind, so if you have to glide into a wind you cannot glide as far over the ground from a given

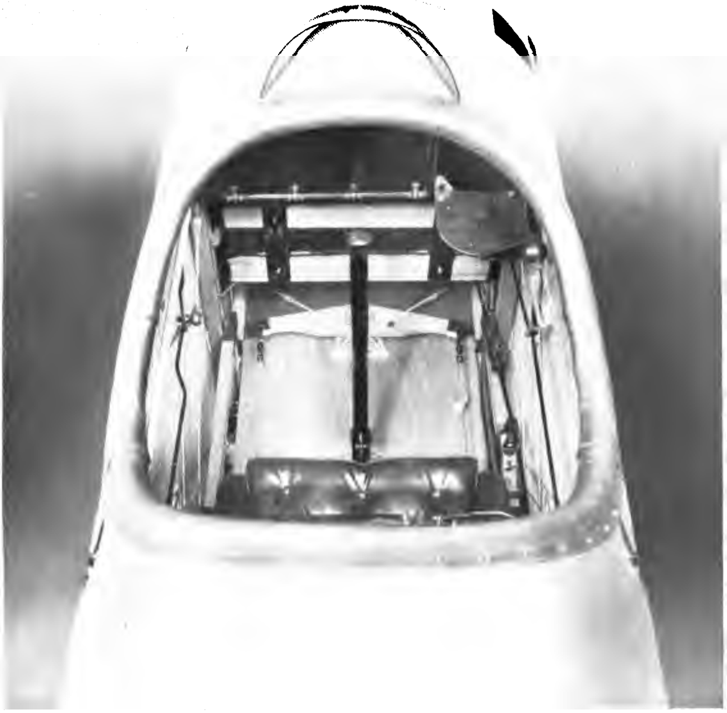


FIG. No. 20

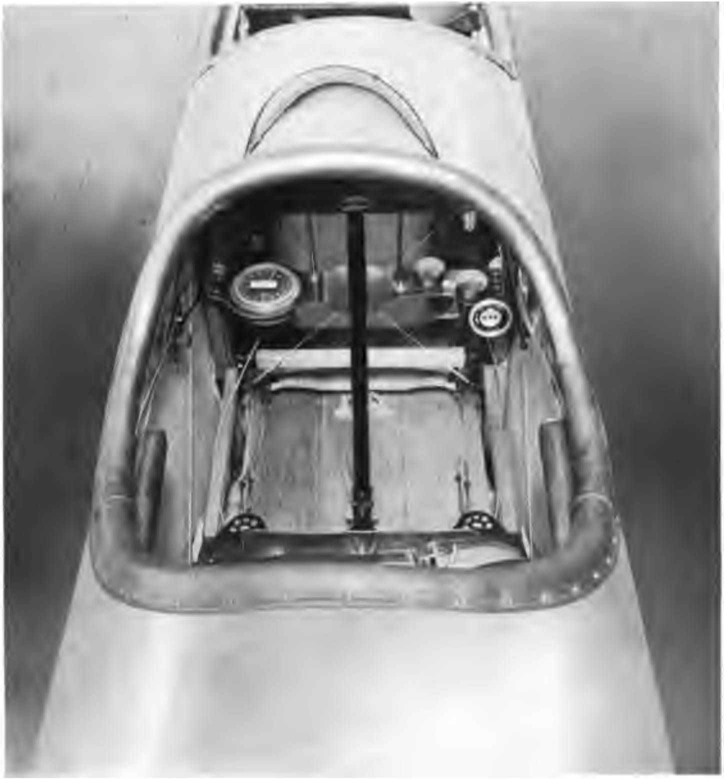


FIG. NO. 21

height as you can if the same wind were behind you. You will also notice by flying in a side wind that in order to keep a straight course over the ground the machine must be swung around into the wind on an angle depending on the velocity of the wind. This is to offset the drift of the machine.

(14) Drift must also be counted on in making turns, for by side drifting the horizon appears to be moving in the opposite direction, which is very apt to mislead one as to his actual turning from the result of the rudder.

LANDING

(15) When within the correct distance for a glide of medium velocity to your contemplated landing place, shut off the engine and nose machine over to the proper gliding angle and head for the field in a direction to bring you directly into the wind. If you find you are too close to the field and your machine is developing excessive speed, start "S-ing" to reduce your speed as well as altitude. If you have considerable altitude to spare an easy spiral may be executed, but neither of these should be tried unless you are perfectly confident of their success. The best way is a long, straight glide into the field, and it gives one a fine chance to judge distance and wind.

(16) Never glide too flat for your speed falls off and you settle instead of glide down. In so doing your controls become inactive to a large degree, and this must be avoided in all cases. A strong blast must be on all controls in the correct direction at all times to have the machine sensitive to their movements. When you have glided toward the field and are still about fifty feet from the ground you should start leveling off, but gradually allow the machine to glide down within about six feet of the ground where the final leveling off begins. At this point the machine is skimming along, neither rising nor falling, until its velocity wanes, then as it sinks you in-

crease the wings' angle to the air so as to bring the lift again up to the weight of the machine for its loss in speed. As the speed lessens the angle should increase more rapidly until the machine is flying in the correct position for landing at its minimum flying speed. At this point the machine should be just grazing the ground with its wheels and tail skid. Only practice will perfect landings, for it's only a combination of good judgment of distances and speeds.

(17) In making turns you will notice the marked tendency of the machine to nose down on a right-hand turn and to climb on a left one, the latter not being so noticeable as the former. These peculiar actions of the machine are caused by the gyroscopic force of the revolving propeller and must be compensated by the elevators to keep the machine level. In banks of over 20 degrees the rudder and elevators begin to exchange their proper actions with one another until the vertical is reached, when the change is complete. This must be clearly understood, for to expect the elevators to control the horizontal balance of the machine when on a steep bank and the rudder to control the direction of same might end disastrously.

(18) The most common danger at present to new students is the spinning nose dive or tail spin. Although it is not dangerous to the man who knows how to get out of one, it is very wise for the beginner to stay well away from the possibilities of having the chance to see if he can get out of one. There are several ways of getting started on a spin, but excessive banking with considerable rudder on seems to be the foremost way of all. In turning, if the nose falls due to stalling or some other cause, a spin may develop. In a spin the ailerons and elevators are useless, for the air blast strikes them from the side instead of straight on. The only available control is the rudder, and this is your best friend. All the possible rudder should be put on in the opposite direction than

you are spinning even if you have to put both feet on one side of the rudder bar. Remember to hold that rudder and keep the motor going full to supply all the possible air blast. This is the only remedy and if you have enough altitude you have nothing to worry about. The centrifugal force of the revolving machine must first be stopped and this takes place somewhat slowly, but as soon as you feel the rudder acting you will feel your elevators and ailerons regaining their control, whereby you can complete the work started by the rudder and regain your proper balance.

IMPORTANT HINTS

1. Remember that "A stitch in time saves nine."
2. Always inspect the motor thoroughly before starting.
3. Always have plenty of oil, water and gasoline before trying to start; all three are vital.
4. See that the radiator is *full* of water before starting.
5. Keep oil and gasoline clean, and free from water.
6. Oil all exposed working parts daily.
7. Be sure to retard magneto before starting; otherwise a serious accident may result.
8. Turn on switch before trying to start.
9. Start the motor with the throttle only part way open.
10. Run the motor idle for only short periods; it is wasteful and harmful to run idle too long.
11. Watch the lubrication constantly, it is most essential.
12. Remember that the propeller is the business end of the motor; treat it with profound respect when it is in motion.
13. When the motor is hot allow it to idle a few minutes at low speed before turning off the switch. This insures the forced circulation of the cooling water until the cylinder walls have cooled considerably and also allows the valves to cool, preventing possible warping.
14. Avoid that destructive disease known as "tinkeritis;" when the motor is working satisfactorily, leave it alone.
15. Be sure to inspect daily all bolts and nuts. Keep them well tightened.
16. Stop the motor instantly upon detecting a knock, a grind, or other noise foreign to perfect operation. It may mean the difference between saving or ruining the motor.
17. Study this instruction book at least once a week.

TABLE No. II

SPECIFIC GRAVITY EQUIVALENTS FOR DEGREES BEAUMÉ FOR LIQUIDS LIGHTER THAN WATER

FORMULA: DEGREES BEAUMÉ $= \dfrac{140}{\text{SP. GR.} \frac{60^\circ}{60^\circ}\text{F.}} - 130$

SP. GR. TAKEN AT 60° F. AND REFERRED TO DISTILLED WATER AT 60° F.

Beaumé	Specific Gravity	Pounds Per Gallon	Beaumé	Specific Gravity	Pounds Per Gallon	Beaumé	Specific Gravity	Pounds Per Gallon
10	1.0000	8.33	37	.8383	6.98	64	.7217	6.01
11	.9929	8.27	38	.8333	6.94	65	.7179	5.98
12	.9859	8.21	39	.8285	6.90	66	.7143	5.95
13	.9790	8.16	40	.8235	6.86	67	.7107	5.92
14	.9722	8.10	41	.8187	6.82	68	.7071	5.89
15	.9655	8.04	42	.8139	6.78	69	.7035	5.86
16	.9589	7.99	43	.8092	6.74	70	.7000	5.83
17	.9524	7.93	44	.8046	6.70	71	.6965	5.80
18	.9459	7.88	45	.8000	6.66	72	.6931	5.78
19	.9396	7.83	46	.7955	6.63	73	.6897	5.75
20	.9333	7.78	47	.7909	6.59	74	.6863	5.72
21	.9272	7.72	48	.7865	6.55	75	.6829	5.69
22	.9211	7.67	49	.7821	6.52	76	.6796	5.66
23	.9150	7.62	50	.7777	6.48	77	.6763	5.63
24	.9091	7.57	51	.7735	6.44	78	.6730	5.60
25	.9032	7.53	52	.7692	6.41	79	.6698	5.58
26	.8974	7.48	53	.7650	6.37	80	.6666	5.55
27	.8917	7.43	54	.7609	6.34	81	.6635	5.52
28	.8861	7.38	55	.7568	6.30	82	.6604	5.50
29	.8805	7.34	56	.7527	6.27	83	.6573	5.48
30	.8750	7.29	57	.7487	6.24	84	.6542	5.45
31	.8696	7.24	58	.7447	6.20	85	.6511	5.42
32	.8642	7.20	59	.7407	6.17	86	.6481	5.40
33	.8589	7.15	60	.7368	6.14	87	.6451	5.38
34	.8537	7.11	61	.7329	6.11	88	.6422	5.36
35	.8485	7.07	62	.7292	6.07	89	.6392	5.33
36	.8433	7.03	63	.7254	6.04	90	.6363	5.30

TABLE No. III

METRIC CONVERSION TABLE

ENGLISH TO METRIC

English Units	Hundredths of an Inch to M/M	Feet to Meters	Miles to Kilometers	Gallons to Liters	Pounds to Kilometers
1	0.254	0.30480	1.6093	3.7853	0.45359
2	0.508	.60960	3.2187	7.5707	.90718
3	0.762	.91440	4.8280	11.3560	1.36078
4	1.016	1.21920	6.4374	15.1413	1.81437
5	1.270	1.52400	8.0467	18.9267	2.26796
6	1.524	1.82880	9.6561	22.7120	2.72155
7	1.778	2.13360	11.2654	26.4973	3.17515
8	2.032	2.43840	12.8748	30.2827	3.62874
9	2.286	2.74321	14.4841	34.0680	4.08233
10	2.540	3.04801	16.0935	37.8533	4.53592
11	2 794	3.35281	17.7028	41.6387	4.98552
12	3 048	3.65761	19.3122	45.4240	5.44311
13	3.302	3.96241	20.9215	49.2093	5.89670
14	3.556	4.26721	22.5309	52.9947	6.35029
15	3.810	4.57201	24.1402	56.7800	6.80389
16	4.064	4.87681	25.7496	60.5653	7.25748
17	4.318	5.18161	27.3589	64.3506	7.71107
18	4.572	5.48641	28.9682	68.1360	8.16466
19	4.826	5.79121	30.5776	71.9213	8.61826
20	5.080	6.09601	32.1869	75.7066	9.07185
21	5.334	6.40081	33.7963	79.4920	9.52544
22	5.588	6.70561	35.4056	83.2773	9.97903
23	5.842	7.01041	37.0150	87.0626	10.43263
24	6.096	7.31521	38.6243	90.8480	10.88622
25	6.350	7.62002	40.2337	94.6333	11.33981
26	6.604	7.92482	41.8430	98.4186	11.79340
27	6.858	8.22962	43.4524	102.2040	12.24700
28	7.112	8.53442	45.0617	105.9893	12.70059
29	7.366	8.83922	46.6711	109.7746	13.15418
30	7.620	9.14402	48.2804	113.5600	13.60777
31	7.874	9.44882	49.8898	117.3453	14.06137
32	8.128	9.75362	51.4991	121.1306	14.51496
33	8.382	10.05842	53.1085	124.9160	14.96855
34	8.636	10.36322	54.7178	128.7013	15.42214
35	8.890	10.66802	56.3272	132.4866	15.87573
36	9.144	10.97282	57.9365	136.2720	16.32933
37	9.398	11.27762	59.5458	140.0573	16.78292
38	9.652	11.58242	61.1552	143.8426	17.23651
39	9.906	11 88722	62.7645	147.6280	17.69010
40	10.160	12 19202	64.3739	151.4133	18.14370
41	10 414	12 49682	65.9832	155.1986	18.59729
42	10.668	12 80163	67.5926	158.9840	19.05088
43	10.922	13 10643	69.2019	162.7693	19.50447
44	11.176	13.41123	70.8113	166.5546	19.95807
45	11.430	13.71603	72.4206	170.3400	20.41166
46	11.684	14.02083	74.0300	174.1253	20.86525
47	11.938	14.32563	75.6393	177.9106	21.31880
48	12.192	14.63043	77.2487	181.6960	21.77244
49	12.446	14.93523	78.8580	185.4813	22.22603
50	12.700	15.24003	80.4674	189.2666	22.67962
100	25.400	30.48006	160.9347	378.5330	45.35924

TABLE No. IV

METRIC CONVERSION TABLE

METRIC TO ENGLISH

Metric Units	M/M to Inches	Meters to Feet	Kilometers to Miles	Liters to Gallons	Kilograms to Pounds
1	0.03937	3.28083	0.62137	0.26418	2.2046
2	.07874	6.56167	1.24274	0.52836	4.4092
3	.11811	9.84250	1.86411	0.79253	6.6139
4	.15748	13.12333	2.48548	1.05671	8.8185
5	.19685	16.40417	3.10685	1.32089	11.0231
6	.23622	19.68500	3.72822	1.58507	13.2277
7	.27559	22.96583	4.34959	1.84924	15.4324
8	.31496	26.24667	4.97096	2.11342	17.6370
9	.35433	29.52750	5.59233	2.37760	19.8416
10	.39370	32.80833	6.21370	2.64178	22.0462
11	.43307	36.08917	6.83507	2.90595	24.2508
12	.47244	39.37000	7.45644	3.17013	26.4555
13	.51181	42.65083	8.07781	3.43431	28.6601
14	.55118	45.93167	8.69918	3.69849	30.8647
15	.59055	49.21250	9.32055	3.96266	33.0693
16	.62992	52.49333	9.94192	4.22684	35.2740
17	.66929	55.77417	10.56329	4.49102	37.4786
18	.70866	59.05500	11.18466	4.75520	39.6832
19	.74803	62.33583	11.80603	5.01937	41.8878
20	.78740	65.61667	12.42740	5.28355	44.0924
21	.82677	68.89750	13.04877	5.54773	46.2971
22	.86614	72.17833	13.67014	5.81191	48.5017
23	.90551	75.45917	14.29151	6.07608	50.7063
24	.94488	78.74000	14.91288	6.34026	52.9109
25	.98425	82.02083	15.53425	6.60444	55.1156
26	1.02362	85.30167	16.15562	6.86862	57.3202
27	1.06299	88.58250	16.77699	7.13280	59.5248
28	1.10236	91.86333	17.39836	7.39697	61.7294
29	1.14173	95.14417	18.01973	7.66115	63.9340
30	1 18110	98.42500	18.64110	7.92533	66.1387
31	1.22047	101.70583	19.26247	8.18951	68.3433
32	1.25984	104.98667	19.88384	8.45368	70.5479
33	1.29921	108.26750	20.50521	8.71786	72.7525
34	1.33858	111.54833	21.12658	8.98204	74.9572
35	1.37795	114.82917	21.74795	9.24622	77.1618
36	1.41732	118.11000	22.36932	9.51039	79.3664
37	1.45669	121.39083	22.99069	9.77457	81.5710
38	1.49606	124.67167	23.61206	10.03875	83.7756
39	1.53543	127.95250	24.23343	10.30293	85.9803
40	1.57480	131.23330	24.85480	10.56710	88.1849
41	1.61417	134.51417	25.47617	10.83128	90.3895
42	1.65354	137.79500	26.09754	11.09546	92.5941
43	1.69291	141.07583	26.71891	11.35964	94.7986
44	1.73228	144.35667	27.34028	11.62381	97.0034
45	1.77165	147.63750	27.96165	11.88799	99.2080
46	1.81102	150.91833	28.58302	12.15217	101.4126
47	1.85039	154.19917	29.20439	12.41635	103.6173
48	1.88976	157.48000	29.82576	12.68052	105.8219
49	1.92913	160.76083	30.44713	12.94470	108.0265
50	1.96850	164.04167	31.06850	13.20888	110.2311
100	3.93700	328.08334	62.13700	26.41776	220.4622

TABLE No. V

VARIATION OF VELOCITY WITH ALTITUDE

(DURING THE DAY)

Elevation	Velocities in miles per hour				
Surface	5	10	15	20	25
500 feet	7	15	21	28	35
1000 feet	8	18	26	34	43
2000 feet	8	18	28	37	47
3000 feet	8	18	29	40	49
4000 feet	10	19	29	40	50
5000 feet	13	20	29	40	50

TABLE No. VI

VARIATION OF DIRECTION OF WIND AND ALTITUDE

Upper region winds vary in direction from those near the earth's surface. The amount of deviation is given approximately in the tabulation:

Elevation	Deviation to right in degrees	Directions			
Surface	0	N	E	S	W
500 feet	5	N ½ E	E ½ E	E ½ S	W ½ W
1000 feet	10	N by E	E by S	S by W	W by N
2000 feet	16	N by E ½E	E by S ½S	S by W ½W	W by N ½N
3000 feet	19	N by E ¾E	E by S ¾S	S by W ¾W	W by N ¾N
4000 feet	20	NNE	ESE	SSW	WNW
5000 feet	21	NNE	ESE	SSW	WNW

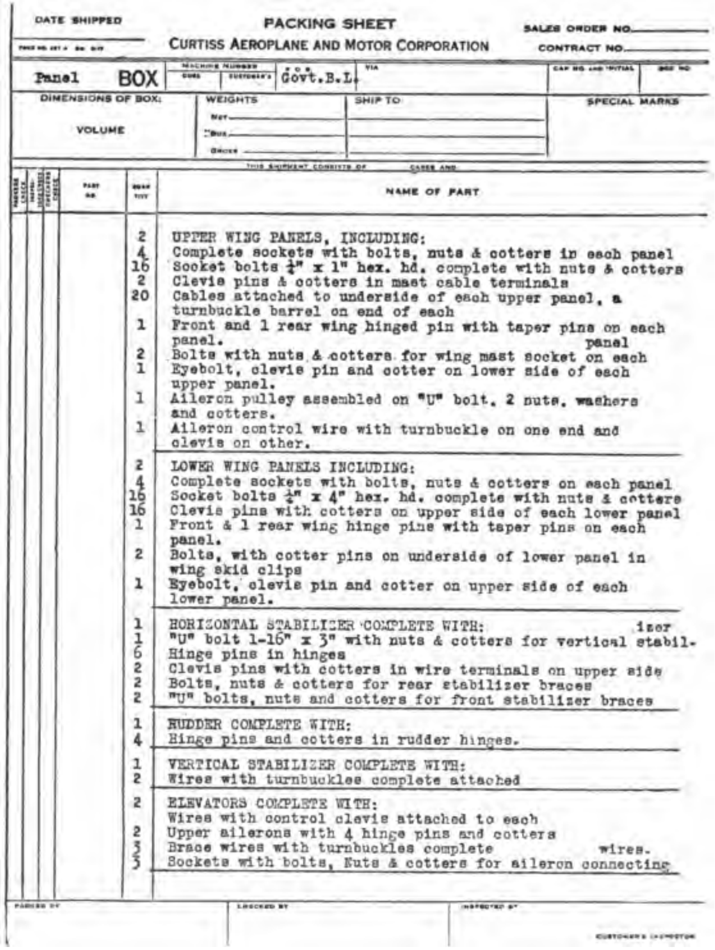
TABLE No. VII

COMPASS POINTS AND THEIR EQUIVALENTS

°	′	Points.	°	′	Points.	°	′	Points.	°	′	Points.
0	00	N	90	00	E	180	00	S	270	00	W
2	49	N ¼ E	92	49	E ¼ S	182	49	S ¼ W	272	49	W ¼ N
5	38	N ½ E	95	38	E ½ S	185	38	S ½ W	275	38	W ½ N
8	26	N ¾ E	98	26	E ¾ S	188	26	S ¾ W	278	26	W ¾ N
11	15	N by E	101	15	E by S	191	15	S by W	281	15	W by N
14	04	N by E ¼ E	104	04	ESE ¾ E	194	04	S by W ¼ W	284	04	WNW ¾ W
16	53	N by E ½ E	106	53	ESE ½ E	196	53	S by W ½ W	286	53	WNW ½ W
19	41	N by E ¾ E	109	41	ESE ¼ E	199	41	S by W ¾ W	289	41	WNW ¼ W
22	30	NNE	112	30	ESE	202	30	SSW	292	30	WNW
25	19	NNE ¼ E	115	19	SE by E ¾ E	205	19	SSW ¼ W	295	19	NW by W ¾ W
28	08	NNE ½ E	118	08	SE by E ½ E	208	08	SSW ½ W	298	08	NW by W ½ W
30	56	NNE ¾ E	120	56	SE by E ¼ E	210	56	SSW ¾ W	300	56	NW by W ¼ W
33	45	NE by N	123	45	SE by E	213	45	SW by S	303	45	NW by W
36	34	NE ¾ N	126	34	SE ¾ E	216	34	SW ¾ S	306	34	NW ¾ W
39	23	NE ½ N	129	23	SE ½ E	219	23	SW ½ S	309	23	NW ½ W
42	11	NE ¼ N	132	11	SE ¼ E	222	11	SW ¼ S	312	11	NW ¼ W
45	00	NE	135	00	SE	225	00	SW	315	00	NW
47	49	NE ¼ E	137	49	SE ¼ S	227	49	SW ¼ W	317	49	NW ¼ N
50	38	NE ½ E	140	38	SE ½ S	230	38	SW ½ W	320	38	NW ½ N
53	26	NE ¾ E	143	26	SE ¾ S	233	26	SW ¾ W	323	26	NW ¾ N
56	15	NE by E	146	15	SE by S	236	15	SW by W	326	15	NW by N
59	04	NE by E ¼ E	149	04	SSE ¾ E	239	04	SW by W ¼ W	329	04	NNW ¾ W
61	53	NE by E ½ E	151	53	SSE ½ E	241	53	SW by W ½ W	331	53	NNW ½ W
64	41	NE by E ¾ E	154	41	SSE ¼ E	244	41	SW by W ¾ W	334	41	NNW ¼ W
67	30	ENE	157	30	SSE	247	30	WSW	337	30	NNW
70	19	ENE ¼ E	160	19	S by E ¾ E	250	19	WSW ¼ W	340	19	N by W ¾ W
73	08	ENE ½ E	163	08	S by E ½ E	253	08	WSW ½ W	343	08	N by W ½ W
75	56	ENE ¾ E	165	56	S by E ¼ E	255	56	WSW ¾ W	345	56	N by W ¼ W
78	45	E by N	168	45	S by E	258	45	W by S	348	45	N by W
81	34	E ¾ N	171	34	S ¾ E	261	34	W ¾ S	351	34	N ¾ W
84	23	E ½ N	174	23	S ½ E	264	23	W ½ S	354	23	N ½ W
87	11	E ¼ N	177	11	S ¼ E	267	11	W ¼ S	357	11	N ¼ W

Table showing the equivalent value in degrees of each fractional division of the compass to the nearest minute of arc:

⅛ point equals	1° 24′
¼ point equals	2° 49′
⅜ point equals	4° 13′
½ point equals	5° 38′
⅝ point equals	7° 02′
¾ point equals	8° 26′
⅞ point equals	9° 51′



DATE SHIPPED

PACKING SHEET

CURTISS AEROPLANE AND MOTOR CORPORATION

SALES ORDER NO.

CONTRACT NO.

Panel BOX

MACHINE NUMBER

F.O.B. Govt.B.L.

VIA

DIMENSIONS OF BOX:

VOLUME

WEIGHTS

Net

Gross

SHIP TO

SPECIAL MARKS

THIS SHIPMENT CONSISTS OF CASES AND

PART NO.	QUANTITY	NAME OF PART
	2	UPPER WING PANELS, INCLUDING:
	4	Complete sockets with bolts, nuts & cotters in each panel
	16	Socket bolts ¼" x 1" hex. hd. complete with nuts & cotters
	2	Clevis pins & cotters in mast cable terminals
	20	Cables attached to underside of each upper panel, a turnbuckle barrel on end of each
	1	Front and 1 rear wing hinged pin with taper pins on each panel.
	2	Bolts with nuts & cotters for wing mast socket on each panel
	1	Eyebolt, clevis pin and cotter on lower side of each upper panel.
	1	Aileron pulley assembled on "U" bolt, 2 nuts, washers and cotters.
	1	Aileron control wire with turnbuckle on one end and clevis on other.
	2	LOWER WING PANELS INCLUDING:
	4	Complete sockets with bolts, nuts & cotters on each panel
	16	Socket bolts ¼" x 4" hex. hd. complete with nuts & cotters
	16	Clevis pins with cotters on upper side of each lower panel
	1	Front & 1 rear wing hinge pins with taper pins on each panel.
	2	Bolts, with cotter pins on underside of lower panel in wing skid clips
	1	Eyebolt, clevis pin and cotter on upper side of each lower panel.
	1	HORIZONTAL STABILIZER COMPLETE WITH:
	1	"U" bolt 1-16" x 3" with nuts & cotters for vertical stabilizer
	6	Hinge pins in hinges
	2	Clevis pins with cotters in wire terminals on upper side
	2	Bolts, nuts & cotters for rear stabilizer braces
	2	"U" bolts, nuts and cotters for front stabilizer braces
	1	RUDDER COMPLETE WITH:
	4	Hinge pins and cotters in rudder hinges.
	1	VERTICAL STABILIZER COMPLETE WITH:
	2	Wires with turnbuckles complete attached
	2	ELEVATORS COMPLETE WITH: Wires with control clevis attached to each
	2	Upper ailerons with 4 hinge pins and cotters
	3	Brace wires with turnbuckles complete
	3	Sockets with bolts, Nuts & cotters for aileron connecting wires.

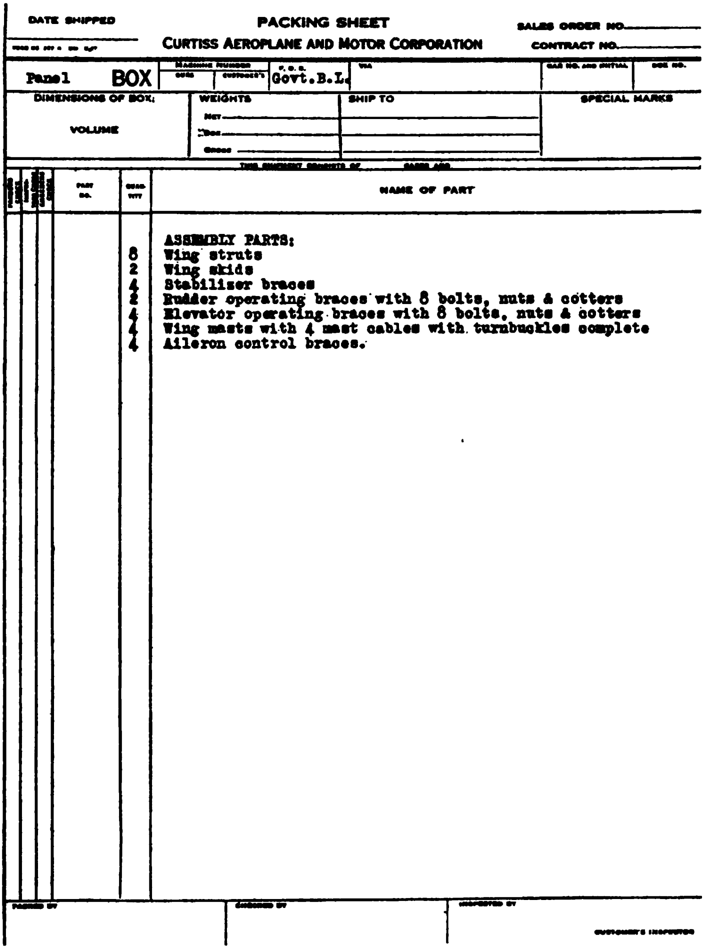
PACKED BY

CHECKED BY

INSPECTED BY

CUSTOMER'S INSPECTOR

FIG. No. 22



DATE SHIPPED

PACKING SHEET

CURTISS AEROPLANE AND MOTOR CORPORATION

SALES ORDER NO.______

CONTRACT NO.______

Panel BOX	MACHINE NUMBER OURS	CUSTOMER'S	F. O. B. Govt. B. L.	VIA	CAR NO. AND INITIAL	BOX NO.

DIMENSIONS OF BOX: VOLUME	WEIGHTS Net Box Gross	SHIP TO	SPECIAL MARKS

THIS SHIPMENT CONSISTS OF CASES AND

PART NO.	QUANTITY	NAME OF PART
		ASSEMBLY PARTS:
	8	Wing struts
	2	Wing skids
	4	Stabiliser braces
	2	Rudder operating braces with 8 bolts, nuts & cotters
	4	Elevator operating braces with 8 bolts, nuts & cotters
	4	Wing masts with 4 mast cables with turnbuckles complete
	4	Aileron control braces.

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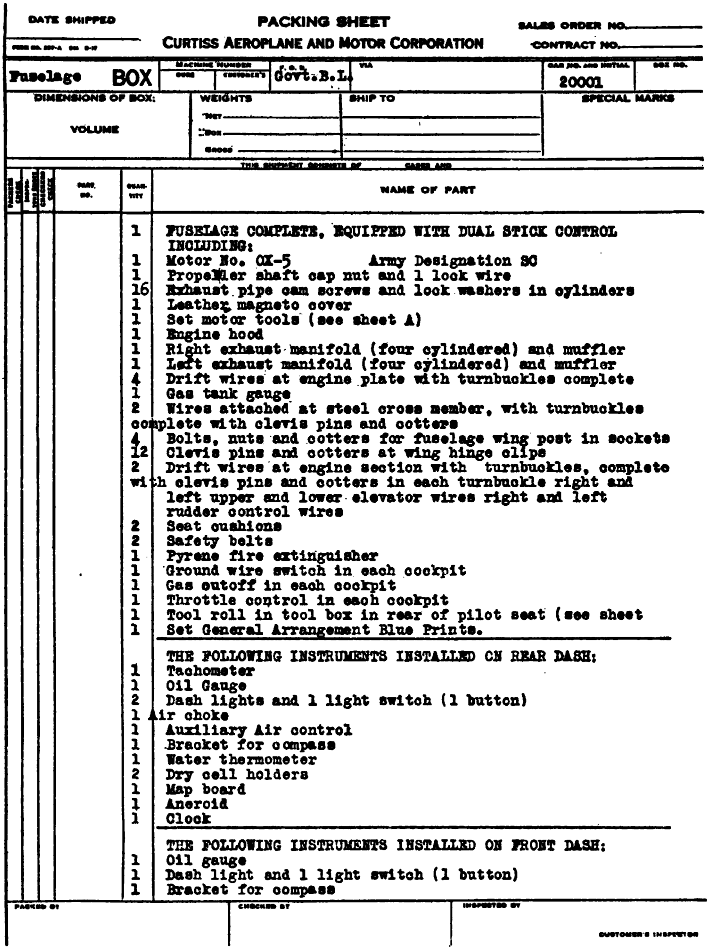
Fig. No. 23



DATE SHIPPED

PACKING SHEET

CURTISS AEROPLANE AND MOTOR CORPORATION

SALES ORDER NO.

CONTRACT NO.

Fuselage BOX

MACHINE NUMBER: OURS / CUSTOMER'S

F.O.B. Govt. B.L.

VIA

CAR NO. AND INITIAL 20001

BOX NO.

DIMENSIONS OF BOX:

VOLUME

WEIGHTS: NET / BOX / GROSS

SHIP TO

SPECIAL MARKS

THIS SHIPMENT CONSISTS OF CASES AND

PART NO.	QUANTITY	NAME OF PART
	1	FUSELAGE COMPLETE, EQUIPPED WITH DUAL STICK CONTROL INCLUDING:
	1	Motor No. OX-5 Army Designation SC
	1	Propeller shaft cap nut and 1 lock wire
	16	Exhaust pipe cam screws and lock washers in cylinders
	1	Leather magneto cover
	1	Set motor tools (see sheet A)
	1	Engine hood
	1	Right exhaust manifold (four cylindered) and muffler
	1	Left exhaust manifold (four cylindered) and muffler
	4	Drift wires at engine plate with turnbuckles complete
	1	Gas tank gauge
	2	Wires attached at steel cross member, with turnbuckles complete with clevis pins and cotters
	4	Bolts, nuts and cotters for fuselage wing post in sockets
	12	Clevis pins and cotters at wing hinge clips
	2	Drift wires at engine section with turnbuckles, complete with clevis pins and cotters in each turnbuckle right and left upper and lower elevator wires right and left rudder control wires
	2	Seat cushions
	2	Safety belts
	1	Pyrene fire extinguisher
	1	Ground wire switch in each cockpit
	1	Gas cutoff in each cockpit
	1	Throttle control in each cockpit
	1	Tool roll in tool box in rear of pilot seat (see sheet
	1	Set General Arrangement Blue Prints.
		THE FOLLOWING INSTRUMENTS INSTALLED ON REAR DASH:
	1	Tachometer
	1	Oil Gauge
	2	Dash lights and 1 light switch (1 button)
	1	Air choke
	1	Auxiliary Air control
	1	Bracket for compass
	1	Water thermometer
	2	Dry cell holders
	1	Map board
	1	Aneroid
	1	Clock
		THE FOLLOWING INSTRUMENTS INSTALLED ON FRONT DASH:
	1	Oil gauge
	1	Dash light and 1 light switch (1 button)
	1	Bracket for compass

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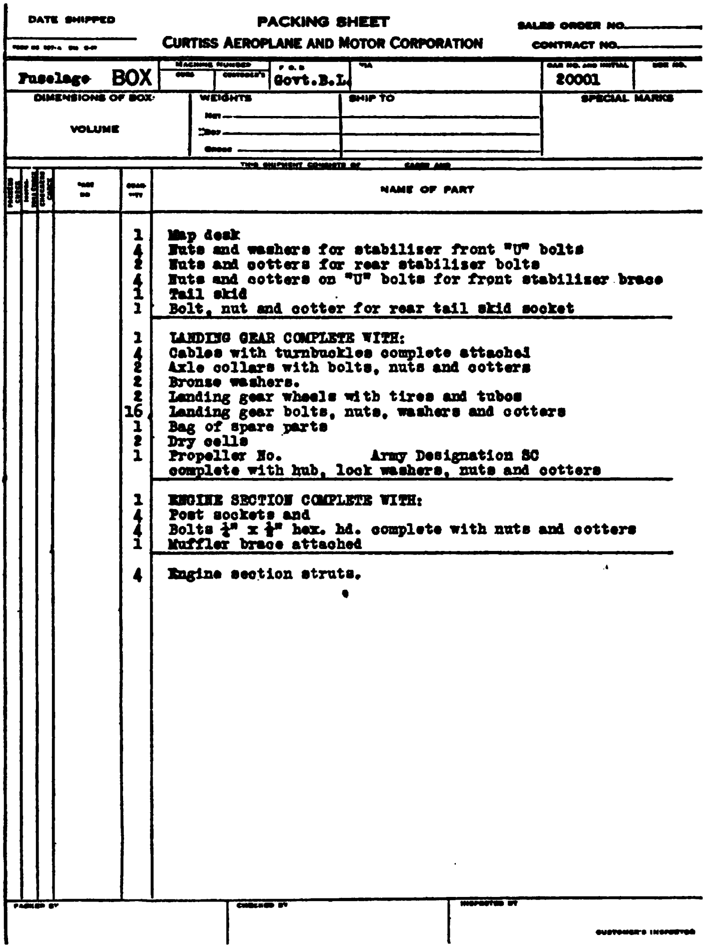
Fig. No. 24



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PACKING SHEET

CURTISS AEROPLANE AND MOTOR CORPORATION

SALES ORDER NO.

CONTRACT NO.

Fuselage BOX	MACHINE NUMBER OURS	CUSTOMER'S	F.O.B Govt.B.L.	VIA	CAR NO. AND INITIAL 20001	BOX NO.

DIMENSIONS OF BOX:

VOLUME

WEIGHTS

Net

Tare

Gross

SHIP TO

SPECIAL MARKS

THIS SHIPMENT CONSISTS OF CASES AND

PART NO	QUANTITY	NAME OF PART
	1	Map desk
	4	Nuts and washers for stabiliser front "U" bolts
	2	Nuts and cotters for rear stabiliser bolts
	4	Nuts and cotters on "U" bolts for front stabiliser brace
	1	Tail skid
	1	Bolt, nut and cotter for rear tail skid socket
	1	LANDING GEAR COMPLETE WITH:
	4	Cables with turnbuckles complete attached
	2	Axle collars with bolts, nuts and cotters
	2	Bronze washers.
	2	Landing gear wheels with tires and tubes
	16	Landing gear bolts, nuts, washers and cotters
	1	Bag of spare parts
	2	Dry cells
	1	Propeller No. Army Designation SC complete with hub, lock washers, nuts and cotters
	1	ENGINE SECTION COMPLETE WITH:
	4	Post sockets and
	4	Bolts ½" x ½" hex. hd. complete with nuts and cotters
	1	Muffler brace attached
	4	Engine section struts.

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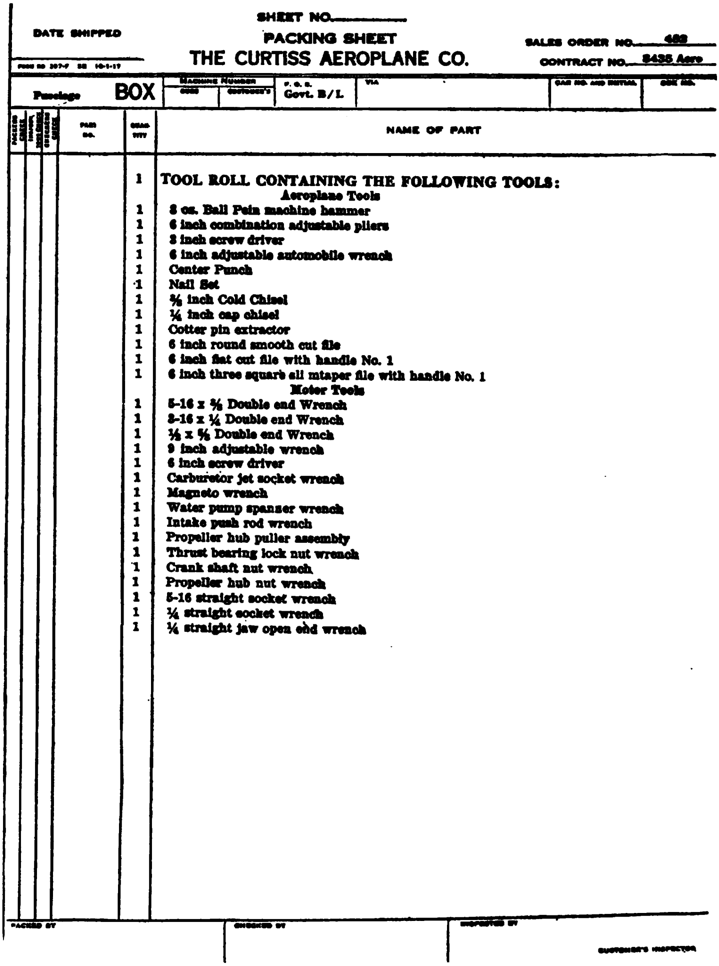
FIG. No. 25



SHEET NO.

DATE SHIPPED

PACKING SHEET

THE CURTISS AEROPLANE CO.

SALES ORDER NO. 482

CONTRACT NO. 8435 Aero

Fuselage BOX	MACHINE NUMBER OURS / CUSTOMER'S	F. O. B. Govt. B/L	VIA	CAR NO. AND INITIAL	BOX NO.

PART NO.	QUANTITY	NAME OF PART
	1	**TOOL ROLL CONTAINING THE FOLLOWING TOOLS:**
		Aeroplane Tools
	1	8 oz. Ball Pein machine hammer
	1	6 inch combination adjustable pliers
	1	8 inch screw driver
	1	6 inch adjustable automobile wrench
	1	Center Punch
	1	Nail Set
	1	⅝ inch Cold Chisel
	1	¼ inch cap chisel
	1	Cotter pin extractor
	1	6 inch round smooth cut file
	1	6 inch flat cut file with handle No. 1
	1	6 inch three square all mtaper file with handle No. 1
		Motor Tools
	1	5-16 x ⅜ Double end Wrench
	1	3-16 x ¼ Double end Wrench
	1	½ x ⅝ Double end Wrench
	1	9 inch adjustable wrench
	1	6 inch screw driver
	1	Carburetor jet socket wrench
	1	Magneto wrench
	1	Water pump spanser wrench
	1	Intake push rod wrench
	1	Propeller hub puller assembly
	1	Thrust bearing lock nut wrench
	1	Crank shaft nut wrench
	1	Propeller hub nut wrench
	1	5-16 straight socket wrench
	1	¼ straight socket wrench
	1	¼ straight jaw open end wrench

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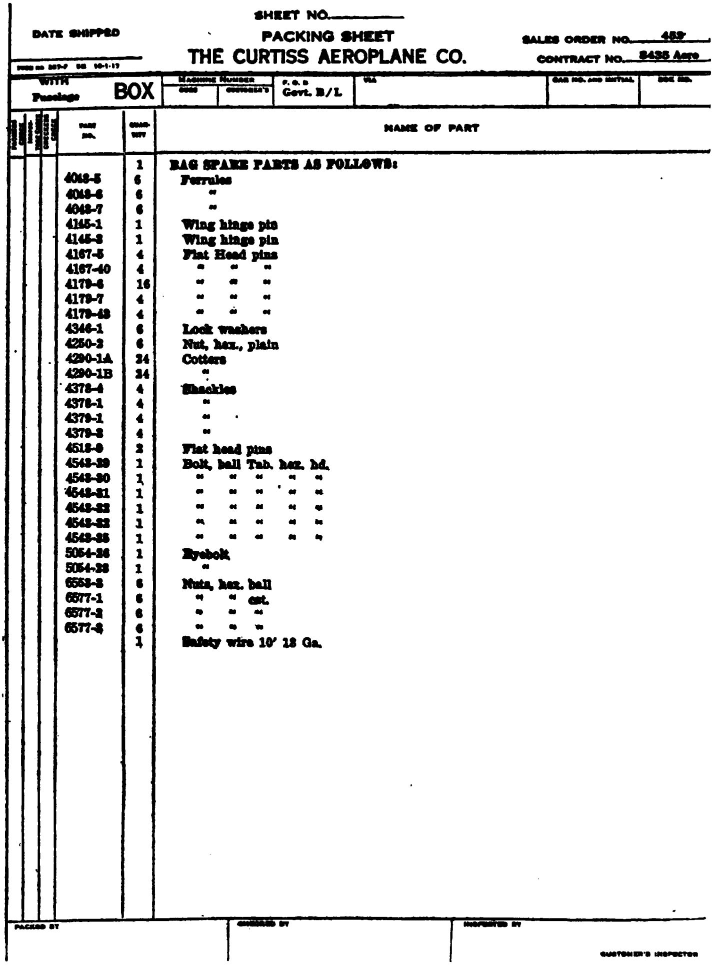
FIG. No. 26



SHEET NO.

DATE SHIPPED

PACKING SHEET

THE CURTISS AEROPLANE CO.

SALES ORDER NO. 452

CONTRACT NO. 2435 Aero

[illegible] 10-1-17

WITH	MACHINE NUMBER Ours	MACHINE NUMBER Customer's	F.O.B.	VIA	CAR NO. AND INITIAL	BOX NO.
Fuselage BOX			Govt. B/L			

PART NO.	QUANTITY	NAME OF PART
	1	BAG SPARE PARTS AS FOLLOWS:
4048-5	6	Ferrules
4048-6	6	"
4048-7	6	"
4145-1	1	Wing hinge pin
4145-3	1	Wing hinge pin
4167-5	4	Flat Head pins
4167-40	4	" " "
4179-6	16	" " "
4179-7	4	" " "
4179-43	4	" " "
4346-1	6	Lock washers
4250-2	6	Nut, hex., plain
4290-1A	24	Cotters
4290-1B	24	"
4378-4	4	Shackles
4378-1	4	"
4379-1	4	"
4379-3	4	"
4518-9	2	Flat head pins
4542-29	1	Bolt, ball Tab. hex. hd.
4542-30	1	" " " " "
4542-31	1	" " " " "
4542-32	1	" " " " "
4542-33	1	" " " " "
4542-35	1	" " " " "
5054-26	1	Eyebolt
5054-28	1	"
6553-2	6	Nuts, hex. ball
6577-1	6	" " cst.
6577-2	6	" " "
6577-3	6	" " "
	1	Safety wire 10' 18 Ga.

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FIG. No. 27

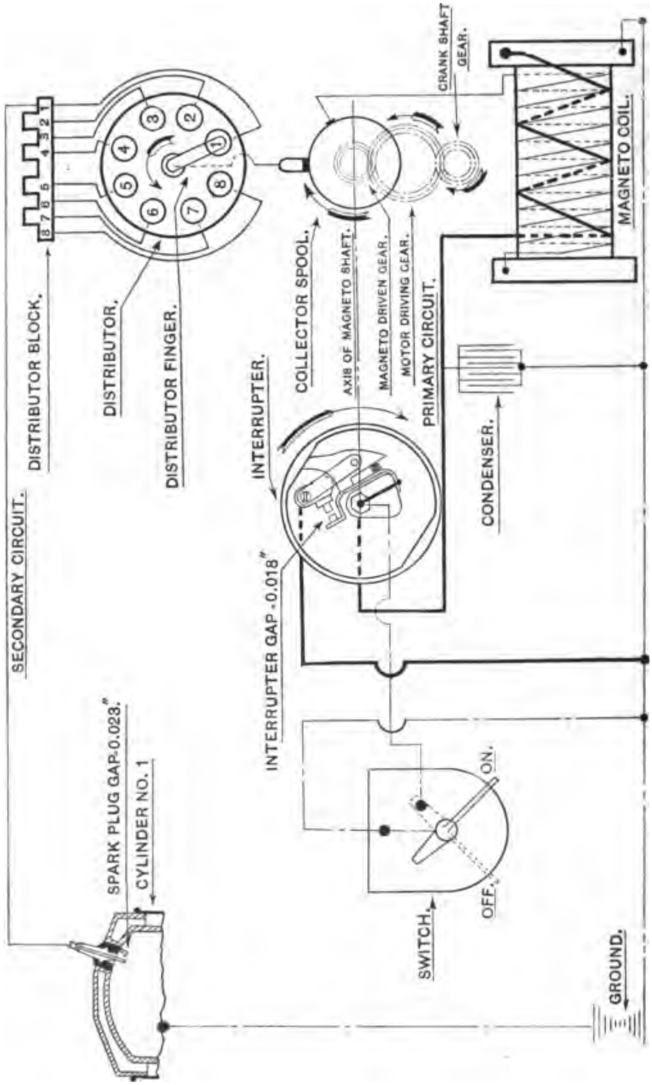
SECONDARY CIRCUIT.
DISTRIBUTOR BLOCK.
8 7 6 5 4 3 2 1
DISTRIBUTOR.
DISTRIBUTOR FINGER.
1
2
3
4
5
6
7
8
INTERRUPTER.
COLLECTOR SPOOL.
AXIS OF MAGNETO SHAFT.
MAGNETO DRIVEN GEAR.
MOTOR DRIVING GEAR.
PRIMARY CIRCUIT.
CRANK SHAFT GEAR.
MAGNETO COIL.
CONDENSER.
INTERRUPTER GAP -0.018"
SPARK PLUG GAP-0.023."
CYLINDER NO. 1
SWITCH.
ON.
OFF.
GROUND.

FIG. No. 30

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